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A RECONNAISSANCE SURVEY OF PUMICE SOILS.

ROTORUA COUNTY.

(Continued.)

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III. KAHAROA AND TE PU.

IN the November and December numbers of the *Journal* it has been shown that the great extent of both Mamaku and Rotorua Basin lands are either sandy loams or sandy silts. The latter occupy by far the greater area.

As one travels north from Lake Rotorua the soil becomes even coarser. This increase in coarseness is due to the larger amount of fine gravel present. A new name is therefore required to designate this type of soil, which should be known as the "Kaharoa fine gravelly sand." It will be seen on comparing the results of analyses that the "fine gravel" fraction, from being almost a negligible quantity in the pumice soils previously described, is now present in quantity ranging from one-fifth to one-quarter by weight of the soil; and when to this is added the stones and gravel which are separated from the soil in preparing it for analysis the coarseness is further increased from another most appreciable cause. Concurrently with the increase in the coarser particles the proportion of the finer particles is necessarily decreased. This extreme coarseness of the soil is noticeable on leaving Hamurana and climbing the slopes of the natural rampart leading to the terrace on the northern slope near the top, above, but facing away from, Rotorua Lake, in scrub land, at 625 ft.,

and in the tawa-rimu-mangeao forest beyond and *below* this terrace land. Has this terrace land ever borne any primitive vegetation larger than scrub which has been removed by the aboriginal owners, or is it that the water content of the soil has not been sufficient for the development of forest? In the forest below, the soil is moister and the trees unusually tall. There is no difference in the mechanical or chemical composition of the soil, save possibly the water content, and this may be the factor which has determined the quality of the natural vegetation, the water draining out readily from the high terrace—a large catchment area—on to the lower slopes now densely forested.

A similar condition of things exists on the area known as the Kapakapa Road, 400 ft. above Rotorua. This road runs along a high slope north of the latter site. The soil is similar to sample R 976, and bush sickness is more prevalent here, the stock having to be changed perhaps oftener than in any other part. At the end of the road, which falls to about 150 ft. above Rotorua, there is some fine land which is much moister and on which the sickness is never experienced. This carries very tall forest similar to that on R 976. Springs are in evidence in many places in the lower area, but are entirely absent on the higher portions of the slope. A similar instance is found on the Kaharoa Road, a forested area; where there are no springs the trouble appears, but where there is plenty of spring or creek water the stock are said to be perfectly healthy. Thus at the extremity and lower portion of these two blind roads the cattle-sickness is unknown. The writer considers this as being a parallel to the well-known case of the lake-side paddocks (see p. 370, December, 1924, *Journal*) and the bush-sick areas up on the hills. Where the soil is kept well saturated with water by seepage from springs or surface water there is no sickness, and where the soil is dependent on rainfall the soil-water so soon drains away that there is not sufficient to act as a carrier of mineral plant-food from the soil to the plant-roots. An analogous case occurred once in the Norsewood district (Hawke's Bay). Here cows suffered in a droughty season from bone malnutrition, although there was chemical evidence that phosphates were not deficient in the soil. The water was probably the limiting factor, the natural pasture being insufficiently nutritious to keep the stock healthy.

In the chemical analyses of these fine gravelly sands there is little to distinguish them from the Rotorua Basin soils save a slightly higher lime content and a slightly lower available iron content. Available and total phosphoric acid, as in all pumice soils, is deficient.

On traversing the Kapakapa, Kaharoa, and the main Rotorua–Tauranga roads in the vicinity of Te Pu the extreme coarseness of the soil is readily discernible to the traveller in the road cuttings. One may, with the aid of mechanical analyses, unhesitatingly affirm that a large extent of country at the north end of the lake is marked by such a coarseness of texture that the student of soil science would be put on his guard and naturally look for untoward results in farming such country; but where the physiography of the country is such that the surface soil is supplied with the optimum requirement of water he would come to lands which unite in the highest degree two essential conditions of fertility—porosity and a constant supply of water.

There is a strong local opinion that the stock by drinking spring-water are thereby cured of bush sickness, or if pastured in the vicinity of springs or creeks never become bush sick; whereas if the drinking-water for stock is supplied from rain-water caught and stored in concrete tanks or cisterns the animals suffer from iron-hunger. Analyses of the waters from springs and tanks, however, afford no evidence to support the truth of this local belief. The explanation of the immunity from iron-starvation which stock enjoy in country which is well watered with springs is probably that in such areas the soil is well supplied with moisture from the high land. The greater moisture content of the soil enables the pasture to absorb larger amounts of plant-food, especially iron, from the soil around it. Such immune areas are not more than 100 ft. to 350 ft. above lake-level, but the worst country is some 400 ft. to 600 ft. above the lake and contains no running water or signs of springs.

An instance was given to the writer by the manager for a very well known landowner who has interests in this area of a mob of 1,000 sheep from Hawke's Bay which were kept here from the end of January until August. Those pastured on country with springs went ahead, but those pastured on adjacent land containing no springs and supplied only with tank-water did not improve in condition. When, however, they were transferred to land with springs they improved like the others.

The obvious treatment which these facts demonstrate as fitting for the farmer to practise on such country is to fence off the area showing unusual moisture in the soil, and to endeavour to enhance to a greater degree the superior fertility which it shows over the drier country by applying the best top-dressing that can be procured. The one that has been found most effective at the Mamaku Demonstration Farm is a mixture of superphosphate and basic slag of high grade. This mixture is a fertilizer containing all the mineral plant-foods which bush-sick country needs—iron, phosphates, calcium in non-caustic form, and sulphur—as well as such elements as manganese. Potash, it should be noted, is present in all pumice soils in comparative abundance.

The climate of the Kaharoa area is possibly much milder than that of Mamaku and even that of Rotorua, for the forest contains two trees, the mangeao and kohekohe, which indicate milder conditions. The forest, which is of the tawa-rimu type, is exceptionally tall, that at the end of the Kaharoa Road consisting as follows:—

Forest trees: *Beilschmiedia tawa, Dacrydium cupressinum* (rimu), *Knightia excelsa* (rewarewa), *Laurelia novae-zelandiae* (pukatea), *Litsaea calicaris* (mangeao), *Podocarpus ferrugineus* (miro).

Shrubs and small trees: *Aristotelia racemosa* (wineberry), *Carpodetus serratus, Dysoxylum spectabile* (kohekohe), *Fuchsia excorticata, Geniostoma ligustifolium, Hedycarya arborea* (porokaiwhiria), *Melicytus ramiflorus* (mahoe), *Metrosideros florida, M. robusta* (rata), *M. scandens, Piper excelsum* (kawakawa), *Rhipogonum scandens* (supplejack), *Rubus australis* (lawyer), *Weinmannia racemosa* (tawhero).

Forest-floor plants: *Alseuosmia macrophylla, Aspidium hispidum, Asplenium bulbiferum, Astelia Solandri, Cyathea dealbata, Hymenophyllum* sp., *Lomaria discolor, L. capense, L. filiformis, Lygodium articulatum, Muehlenbeckia australis, Polypodium pennigerum, P. punctatum, P. serpens, Pteris scaberula, Uncinia* sp.

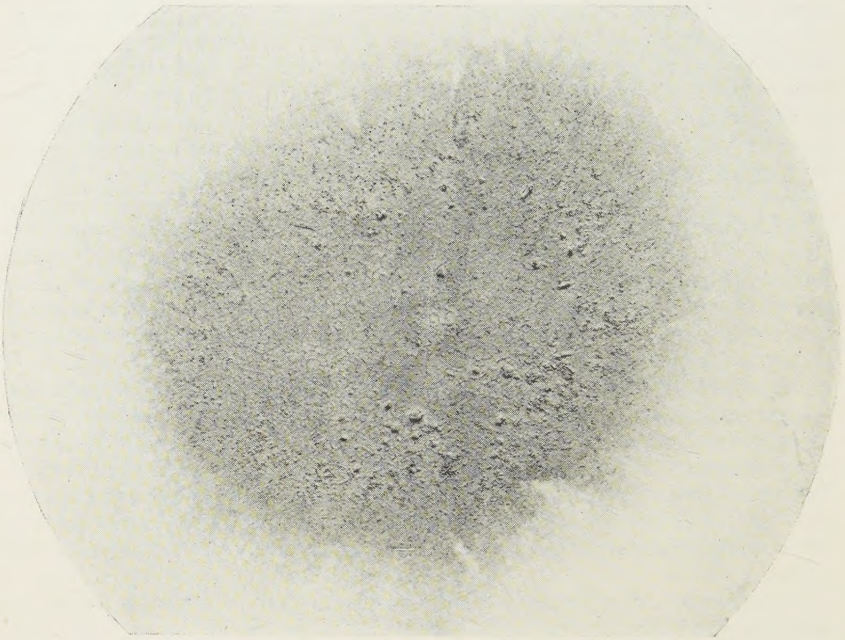


FIG. 7. LOAM SOIL, WELLINGTON (LABORATORY NO. R 814).

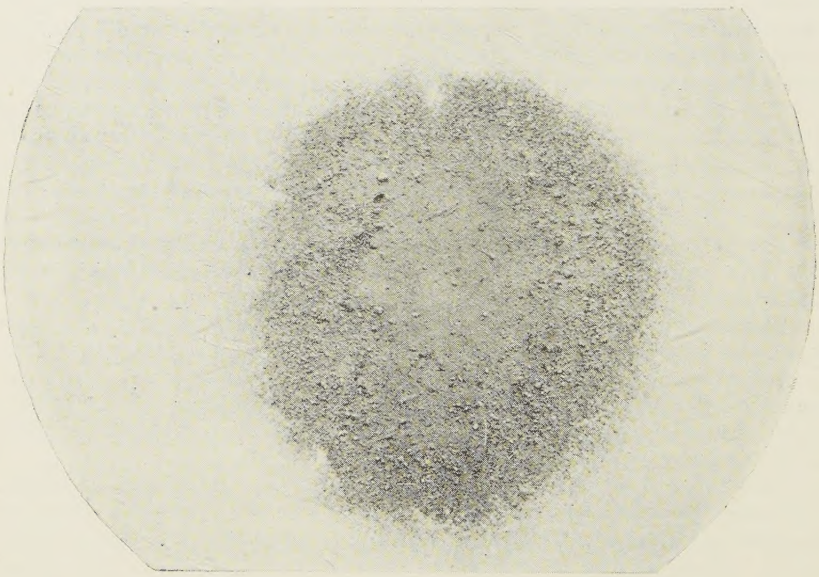


FIG. 8. SANDY LOAM, OTUROA, MAMAKU (R 1138).

FIG. 9. SANDY SILT, MAMAKU (S 182).

FIG. 10. FINE GRAVELLY SAND, KAHAROA (R 1117).

[*Photos by Chemical Laboratory.*

The illustrations show the texture of the three main types of pumice soils described in the last three numbers of the *Journal*—together with a Wellington soil for comparison—when treated in the following manner and allowed to dry and then photographed: 2 c.c. of fine earth are mixed with 3 c.c. of water in a 10 c.c. glass cylinder, and after light rubbing with a rubber-tipped stirring-rod are shaken for four minutes. A 15 cm. filter-paper is moistened with 3 c.c. of water and spread flat on a horizontal plate of glass. The cylinder of soil and water, closed by the thumb, is inverted 1 cm. above the centre of the paper, and the contents are rapidly released. The extent to which the soil becomes spread over the paper is seen to vary with the fineness—*i.e.*, as the soil becomes increasingly finer the larger is the area covered; conversely, the coarser the soil the smaller is the space occupied. The Wellington loam (R 814) shows what a good fertile soil looks like. The Oturoa sandy loam (K 1138) closely resembles the first, but is slightly coarser; the Mamaku sandy silt (R 182) is obviously a very coarse-grained soil; while the Kaharoa fine gravelly sand (R 1117) is the extreme type of coarse pumice soils. The disk partly shown in each illustration represents the 15 cm. filter-paper (about 6 in. diameter), and thus gives the reduced scale.

TABLE 5. MECHANICAL ANALYSES.

(Results, except R 970, are percentages on air-dried soil.)

Laboratory No.	Description of Soil. (Classification of United States Department of Agriculture, modified.)	Analysis of "Fine Earth" passing 2 mm. Sieve.								Stones and Gravel.	Remarks
		Fine Gravel.	Coarse Sand.	Fine Sand.	Silt.	Fine Silt.	Clay.	Moisture.	Loss on Ignition.		
					Coarsest Pumice Lands.						
R 1105	Fine gravelly sand	26·0	38·3	11·1	8·6	3·9	1·2	1·6	8·4	8·6	Pasture, Kaharoa Road; 200 ft. above Lake Rotorua.
1108	,, ..	20·6	46·1	9·0	6·9	5·0	1·1	1·5	10·3	7·2	Pasture, Glenmore, Kaharoa Road 130 ft. above Lake Rotorua.
1114	Coarse sand	13·7	52·6	11·2	8·6	4·7	1·3	1·0	6·7	5·1	Pasture, Kaharoa Road.
1117	Fine gravelly sand ..	20·3	44·0	11·8	9·9	3·6	1·2	1·3	7·5	3·1	Pasture, Kapakapa Road; terrace, 400 ft.
1121	,, ..	17·9	52·1	9·3	7·8	4·4	0·6	1·1	6·4	5·1	Pasture, Kapakapa Road; 150 ft.
1134	Coarse sand	11·9	48·4	13·7	9·7	5·4	1·4	1·9	7·7	13·0	Lake Rotoiti, fern slopes; 105 ft.
1136	,, ...	2·9	55·4	15·5	10·7	6·4	1·9	0·9	6·5	3·1	Pasture, flat-topped ridge, Lake Rotoiti; 100 ft.
1143	Fine gravelly sand ..	23·7	39·0	10·7	8·2	7·7	0·8	1·2	8·6	5·0	Forest, Mangarewa–Kaharoa Gorge; little birch.
1145	,, ..	19·6	33·0	13·2	12·3	7·1	2·2	2·4	10·6	15·0	Fern land, Kaharoa – Te Pu Road.
973	,, ..	26·9	33·7	13·5	8·9	4·7	0·8	2·4	8·0	15·4	Scrub land; 625 ft. above Lake Rotorua.
976	,, ..	19·8	38·8	14·9	8·4	5·3	0·8	1·0	9·1	13·6	Forest, rimu-tawa-mangeao.
970	,, ..	21·2	32·7	15·9	9·9	4·9	0·1	1·7	11·9	19·0	Fern and scrub regrowth, Hamurana; 300 ft. above lake.
S 61	Coarse sand	12·6	32·0	12·5	9·3	4·6	1·7	23·3	5·7	..	Pasture, Rotorua Lake side; probably floated beach.
H 480	Fine gravelly sand ..	16·8	45·6	17·9	8·3	2·3	1·2	3·5	4·1	20·0	Pasture, Rotorua Lake side; probably floated beach.
482	,, ..	17·6	41·7	12·8	15·0	3·5	1·2	1·3	6·8	24·1	Waerenga East.

Mechanical analyses by R. E. Grimmett.

TABLE 6. CHEMICAL ANALYSES.

(Results, except *, are percentages on soil dried at 100° C.)

Laboratory No.	Locality.	Volatile Matter.			Total Nitrogen.	1-per-cent. Citric-acid Extract, Dyer's Method; Hall's Modification ("Available" Plant-food).				Hydrochloric-acid Extract ("Total" Plant-food).				Hydrogen-ion Determination.	Fe (Iron) Extracted by 1-per-cent. Citric Acid.
		*On Air-drying.	*At 100° C.	On Ignition.		Lime, CaO.	Magnesia, MgO.	Potash, K_2O.	Phosphoric Acid, P_2O_5.	Lime, CaO.	Magnesia, MgO.	Potash, K_2O.	Phosphoric Acid, P_2O_5.	pH Value.	
	Coarsest Pumice Lands.														
R 1105	Rotoiti S.D., Block 5, Section 2 ..	13	1·74	7·97	0·225	0·289	0·042	0·031	0·010	0·35	0·16	0·09	0·02	..	0·032
1108	Glenmore, 130 ft.	29	1·82	10·28	0·294	0·156	0·060	0·020	0·006	0·71	0·31	0·13	0·02	..	0·032
1114	Rotoiti S.D., Block 2, Section 7 ..	15	1·00	6·42	0·192	0·109	0·041	0·016	0·004	0·40	0·22	0·11	0·02	..	0·037
1117	Kapakapa Road, 410 ft.	18	1·68	7·63	0·208	0·161	0·026	0·016	0·006	0·31	0·16	0·15	0·04	..	0·036
1121	Kapakapa Road, 150 ft., grass ..	13	1·06	6·71	0·235	0·448	0·036	0·015	0·011	0·66	0·23	0·09	0·04	..	0·037
1134	Rotoiti, 105 ft.	18	1·96	7·94	0·211	0·139	0·031	0·016	0·006	0·86	0·29	0·12	0·03	..	0·023
1136	Rotoiti, 100 ft., flat-topped ridge ..	14	1·18	6·39	0·208	0·307	0·016	0·024	0·008	1·43	0·53	0·16	0·03	..	0·040
1143	Mangarewa Gorge, 445 ft.	23	1·60	9·03	0·222	0·172	0·026	0·020	0·004	0·46	0·10	0·05	0·02	5·5	0·017
1145	Kaharoa, 365 ft.	23	2·60	11·00	0·221	0·089	0·026	0·026	0·004	0·22	0·17	0·08	0·03	..	0·036
973	Rotoiti, scrub	13	2·44	8·17	0·230	0·109	0·020	0·018	0·004	0·32	0·22	0·09	0·04	..	0·018
976	Rotoiti, forest	29	1·00	8·44	0·255	0·143	0·033	0·019	0·002	0·47	0·20	0·08	0·03	..	0·028
970	Hamurana, 300 ft.	28	1·70	12·06	0·224	0·125	0·058	0·023	0·005	0·45	0·23	0·08	0·06	..	0·020
S 61	Lake-side, Rotorua	..	23·32	7·40	0·197	0·150	0·022	0·011	0·006	0·32	0·12	0·07	0·04	..	0·023

The heights stated are feet above Lake Rotorua, which itself is 915 ft. above sea-level.

Chemical analyses by L. D. Foster.

A good deal of the country about here has been tutu and fern land, and possibly represents old Maori clearings.

In spite of the great coarseness of these Kaharoa and Te Pu soils there are mitigating circumstances which improve the prospects of the settler on these lands and reconcile him to his lot. One would think that the climate is warmer and the land more sheltered from winds than are most pumice lands, but the great factor in combating adverse soil conditions must be the proximity of land free from bush sickness and suitable for change paddocks. One other factor is the freedom from the counter-attraction of more remunerative forms of industry. There is no sawmilling trade or tourist traffic to absorb the energies of the settlers, and consequently the community is purely a farming one; the interests of all are identical. The visitor is impressed with the fine type of settlers and the way they are combining for the common good; so that even on the worst class of country—the soil of which is so coarse and dry that the stock have to be changed twice a year—there is a healthy optimistic tone about the district which is most cheering and helpful to the investigator of a difficult problem.

CLEANING OF MILKING-MACHINES.

J. W. SMITH, Dairy Instructor, Palmerston North.

In the course of his visits to farms for assisting and instructing farmers in dairy-work the writer has found many and varied methods of cleaning milking-machines in vogue, and is satisfied that there is a laudable desire on the part of users to keep their machines in a clean condition, and to carry out the work in a way which will ensure the longest possible working-life of all parts, particularly the rubberware.

In many cases more time is spent on the work of cleaning than is really necessary, the life of the rubbers is shorter than need be, and, in addition, too much faith is placed in the supposed merits of more or less costly commercial preparations for cleaning dairy appliances. Some cleansing-material is necessary to remove greasy deposits left by the milk, and no material will effect this more thoroughly or at a lower cost than a solution of soda. Either washing-soda or caustic soda may be used. Care and judgment must be exercised in using soda solution, for should any get into the milk the effect is disastrous, especially when the milk is for making into cheese. Furthermore, damage may result to the machine or other apparatus to which a soda solution is applied if the latter is not promptly and completely removed after use.

THE CAUSTIC-SODA-AND-BOILING-WATER METHOD.

Of the many methods which have come within the writer's experience he would direct special attention to the caustic-soda-and-boiling-water method, which a number of practical farmers have been using for about two seasons with excellent results in respect to the sanitary condition of the milk, the cleanliness of the machine, an extended life for the rubberware, and a considerable saving of time.

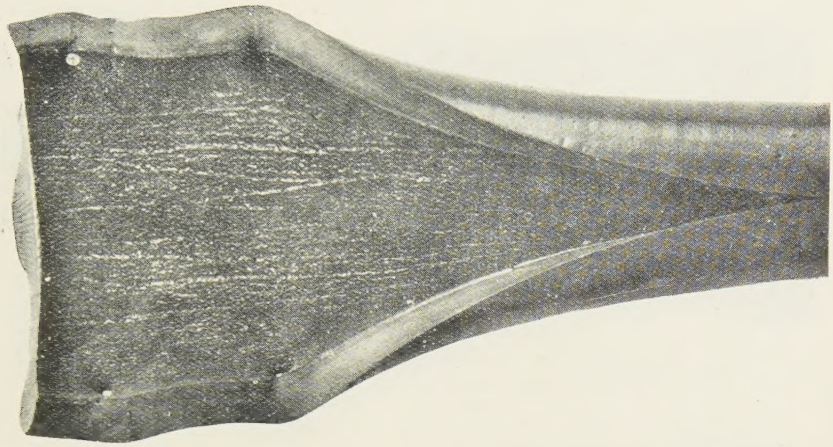


FIG. 1. LONG MILK-RUBBER AFTER TWELVE MONTHS' USE AND CLEANING DAILY WITH BOILING WATER, WASHING-SODA, AND THE USE OF A BRUSH AND SCRAPER. NOTE THE SCORED INNER SURFACE OF THE TUBE.

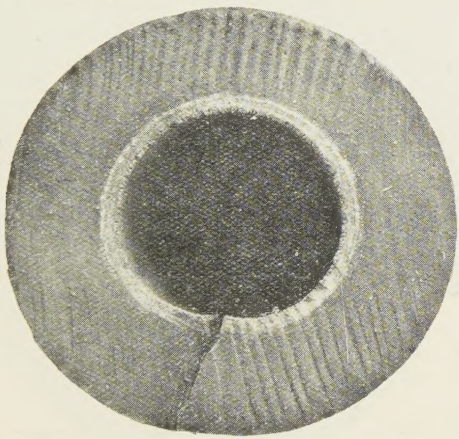


FIG. 2. END VIEW OF THE SAME RUBBER (FIG. 1). THE WHITISH INNER CIRCLE INDICATES THE SCORED SURFACE OF THE TUBE.

The writer has been demonstrating and recommending this method for several months, and is confident as to its efficiency, provided it is carefully carried out.

The quantity of boiling water required is small, but the water must be at boiling temperature—not merely hot or warm. The hot water from the jacket of an oil or benzine engine is not sufficiently high in temperature, and therefore its use is not recommended. The caustic-soda solution must be well stirred and thoroughly dissolved in the boiling water. The solution will not spoil tinned ware, provided it is rinsed off immediately after use. Care must be taken to prevent the solution lodging in the milk-holding vat. No scrapers or spiral

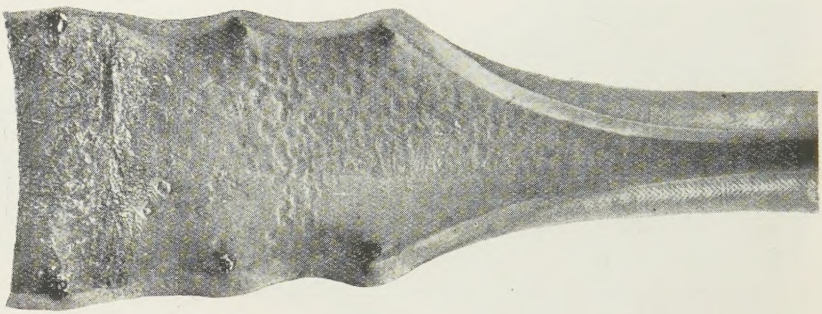


FIG. 3. CLAW-TUBE RUBBER FROM THE SAME MACHINE AS MILK-TUBE IN FIGS. 1 AND 2. THE INDENTATIONS INDICATE EFFECT OF LODGMENT OF GREASE.

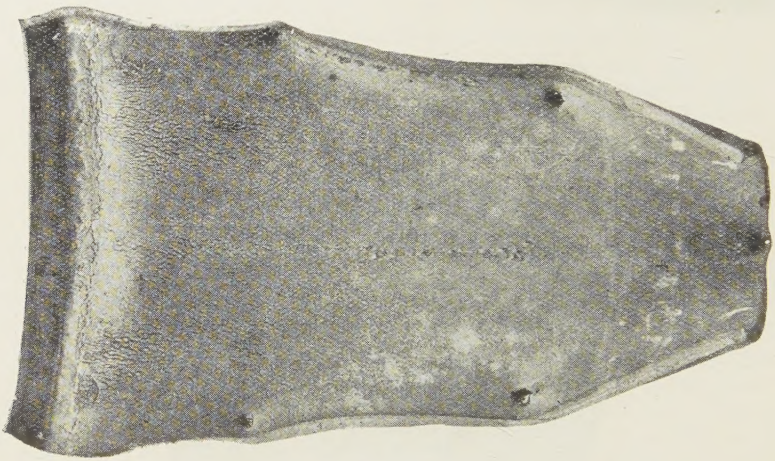


FIG. 4. ORDINARY TEAT-CUP SOFT INFLATION AFTER THREE MONTHS' USE, SHOWING THE EFFECTS OF BRUSHING.

hair-brushes are necessary for cleaning the inner surface of the rubbers, and scoring is thereby avoided. The outside as well as the inside of the rubbers must be kept clean, otherwise their life is shortened. Rubbers after being cleaned should be laid out without bends or twists. To operate the method successfully it must be done immediately after milking. The time taken to complete the work need not exceed twenty minutes.

The essentials required at the milking-shed are—(1) a suitable plant for boiling water; (2) a stock of caustic soda; (3) an ample supply of clean water; (4) some scrubbing-brushes, large buckets, a suitable bath or tub, and a ball of horsehair.

To operate the method the procedure is as follows:—

(1.) Before milking draw cold water through all milk-tubes and the releaser, so as to prevent the adhesion of milk to the pipes, &c.

(2.) Immediately after milking wash all dirt off the outside of the teat-cups and rubbers; then draw through each set of teat-cups

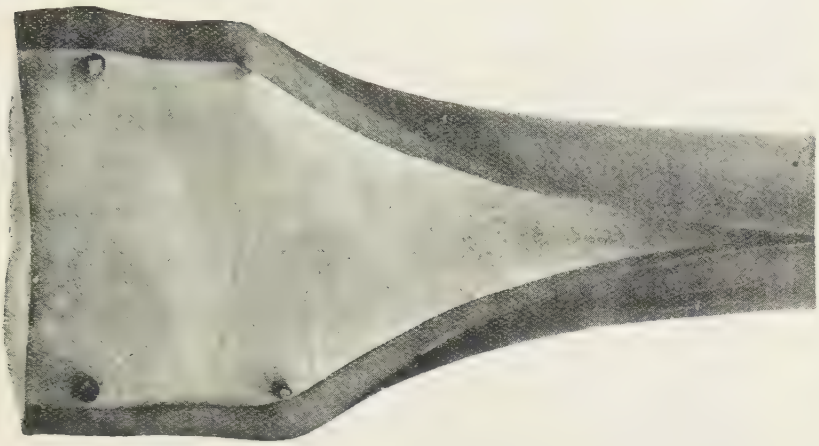


FIG. 5. LONG MILK-RUBBER AFTER TWO SEASONS' USE AND CLEANING DAILY BY THE CAUSTIC-SODA-AND-BOILING-WATER METHOD.

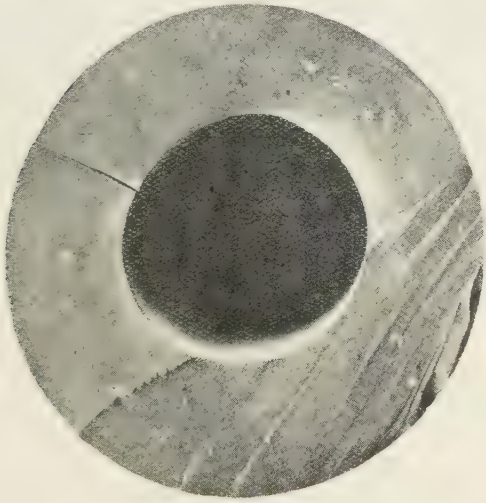


FIG. 6. END VIEW OF THE SAME RUBBER (FIG. 5).

sufficient cold (or preferably warm) water to flush out the milk-system. When drawing the water through the set farthest from the releaser insert a ball of horsehair in the end of the milk-pipe, to cause it to travel through to the releaser with the water.

(3.) Next draw through *each set* of teat-cups *not less than 1 gallon of boiling water* to which caustic soda has been added at the rate of *not less than one to 1½ tablespoonfuls per 4 gallons of boiling water.* Distribute the solution as evenly as possible through each set of teat-cups.

(4.) Immediately follow by flushing out the caustic-soda solution with 2 gallons of hot water or 1 gallon of boiling water for each

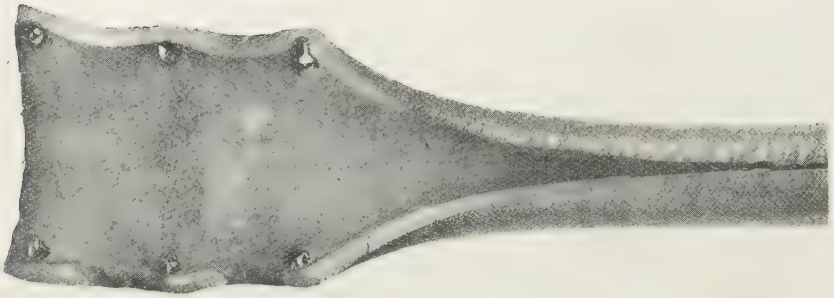


FIG. 7. CLAW-TUBE RUBBER FROM THE SAME MACHINE AS MILK-TUBE IN FIG. 5.

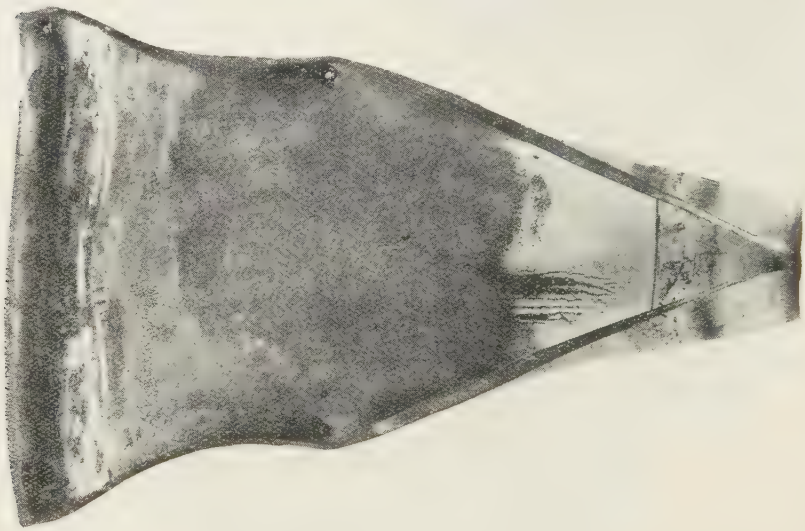


FIG. 8. ORDINARY TEAT-CUP SOFT INFLATION AFTER FOUR MONTHS' USE AND CLEANING BY THE CAUSTIC-SODA-AND-BOILING-WATER METHOD.

set of teat-cups. The flushing with boiling water helps to dry the rubbers and leaves the milk-system dry and sweet.

(5.) Then remove or open the plug or flap from the releaser-pipe, to allow of free circulation of air.

(6.) Next clean the vacuum-system in the same manner as the milk-system, by drawing through first the caustic-soda solution, and next the boiling water which has been circulated through the milk-system. Pay particular attention to the cleaning of the pipe connecting the releaser to the vacuum-tank, by flooding the releaser to cause the water to travel through to the vacuum-tank. *This is important.*

(7.) The engine can now be stopped. Disconnect the two long rubbers from downpipes and teat-cups, and hang in a clean airy place out of the sun.

FIG. 9. A GROOVED HARD TEAT-CUP INFLATION AFTER TWELVE MONTHS' USE AND CLEANING BY THE SAME METHOD. CAPABLE OF THREE MONTHS' FURTHER USE.

[*All photos by H. Drake.*

(8.) Next disconnect the releaser, wash, rinse, and place in a clean, dry, sunny place; then disconnect the top or bottom half of the vacuum-tank and treat in a similar manner.

To ensure effective cleaning by this method it is essential that it be carried out daily in the manner directed. The caustic-soda solution instantly removes the greasy coating left by the milk on the inner surface of the tubing, and the final flushing with boiling water ensures the removal of the caustic-soda solution. In a short time the inner surface of the rubbers, through the action of the caustic soda, will become coated with a hard glass-like surface. If, however, the method is not carried out daily in the manner directed the grease will penetrate into the rubber, and it will then be necessary to revert to the use of spiral brushes, which in turn will damage the inner surface, as indicated in the accompanying illustrations.

The photographs are of rubbers which have been in actual use and subjected to different methods of cleaning. These serve to demonstrate the good results obtainable by the use of the caustic-soda-and-boiling-water method of cleaning.

CORTICIUM-DISEASE OF POTATOES.

EXPERIMENTS IN CONTROL.

G. H. CUNNINGHAM, Mycologist, Biological Laboratory, Wellington.

CORTICIUM-DISEASE, caused by the fungus *Corticium vagum* Berk. *et* Curt., var. *Solani* Burt, is a widespread disease of the potato, for it has been recorded as occurring wherever the host is grown. During a recent plant-disease survey made by Mr. J. C. Neill, of this Laboratory, through the potato-growing regions of New Zealand it was invariably found to be present; and in the South Island it was found to be abundant in every line of potatoes inspected. Although so widespread, it is a disease that is commonly overlooked, due no doubt to the fact that its effects upon the host are not marked.

When the crop is being lifted the disease may be seen in the form of small black sclerotia scattered over the surface of the tuber (Fig. 1). These sclerotia are resting bodies of the causal organism, capable of remaining in a quiescent condition for an indefinite period. They are firmly attached to the tubers by means of hyphæ, and are not readily removed, consequently they accompany the tubers when the latter are planted. In the presence of moisture, such as is present in the soil, the sclerotia produce hyphæ which ramify through the soil in the vicinity of the tubers, and spread to the potato-shoots as they develop. These hyphæ would appear frequently to damage the growing points of the main shoots, with the result that secondary shoots are produced from below the injured portions. In this manner affected tubers may give rise to bunches of small and spindly shoots, which, being weakened, produce small and stunted plants; these in turn produce few and small tubers. Thus infection, when severe, may tend greatly to reduce the yield.

In the literature dealing with this disease the standard treatment recommended (1, 3, 4, 5, 6, 8),* which has been claimed to give complete control (100 per cent. killing of sclerotia), is the immersion of infected tubers in a solution of mercuric chloride (corrosive sublimate, $HgCl_2$) in water—1 part in 1,000 parts of water, or 1 part in 2,000—for one and a half or two hours. More recently it has been claimed (2)* that immersion for half an hour is sufficient to ensure death of all sclerotia.

A potato-grower in Otago this season treated the whole of his seed-tubers before sowing by immersion for one hour and a half in 1–1,000 mercuric chloride. After treatment he forwarded samples to this Laboratory to ascertain whether the treatment had been successful. Sclerotia from these tubers were plated out on suitable media, and 30 per cent. were found to be viable. This led to preliminary experiments being carried out in the Laboratory with a view to ascertaining whether the standard solutions recommended were at fault. These experiments were unsatisfactory in that a proportion of sclerotia treated were found to be viable. Therefore an elaborate series of experiments was undertaken with a view to definitely ascertaining the most

* References at end of this article.

efficient steep to be used, its strength, and the most suitable time of immersion (one hour and a half being considered much too long for farm practice).

In the following experiments tubers showing well-developed sclerotia were chosen. They were washed free from adhering earth and allowed to dry. The solutions were prepared in large glass vessels, and the tubers immersed for definite periods of time, then removed, labelled, and air-dried. Three tubers were considered sufficient for each phase of the experiment, and from each five sclerotia were removed and transferred to petri dishes containing certain culture-media—the most suitable being potato-dextrose-agar, which gave 100 per cent. of growth in controls. Each petri dish, by means of grease-pencil markings on the bottom, was divided into three sectors, and in each sector five sclerotia were placed. In this manner economy of media and petri dishes was obtained.

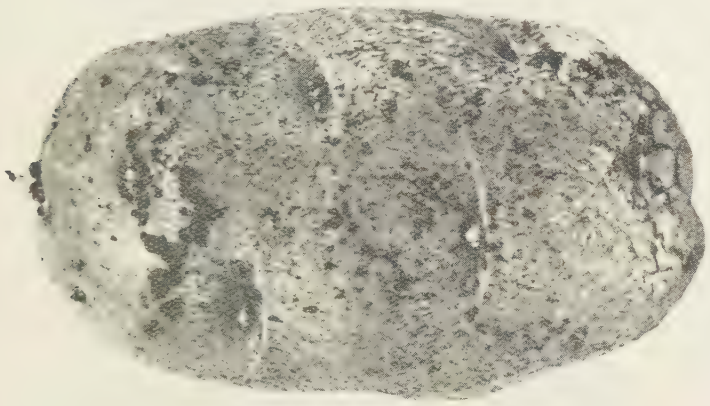


FIG. 1. POTATO TUBER COVERED WITH SCLEROTIA OF CORTICIUM-DISEASE. TWO-THIRDS NATURAL SIZE.

[*Photo by H. Drake.*

During the course of each experiment cultures were examined every twenty-four hours for five days, the final examination being made under the dissecting microscope. The cultures were then discarded, for it was found that if treated sclerotia made no growth before the third day they would not grow at all.

MERCURIC CHLORIDE ($HgCl_2$).

The first series of laboratory experiments was undertaken with a view to determining whether the mercuric solutions recommended would really kill sclerotia, and with the additional object of cutting down the time of immersion. The following strengths of solutions and times of immersion were used:—

Mercuric chloride—1–500, 1–750, 1–1,000, 1–1,250, 1–2,000, 1–2,500.
Times of immersion—15, 30, 45, 60, and 90 minutes.

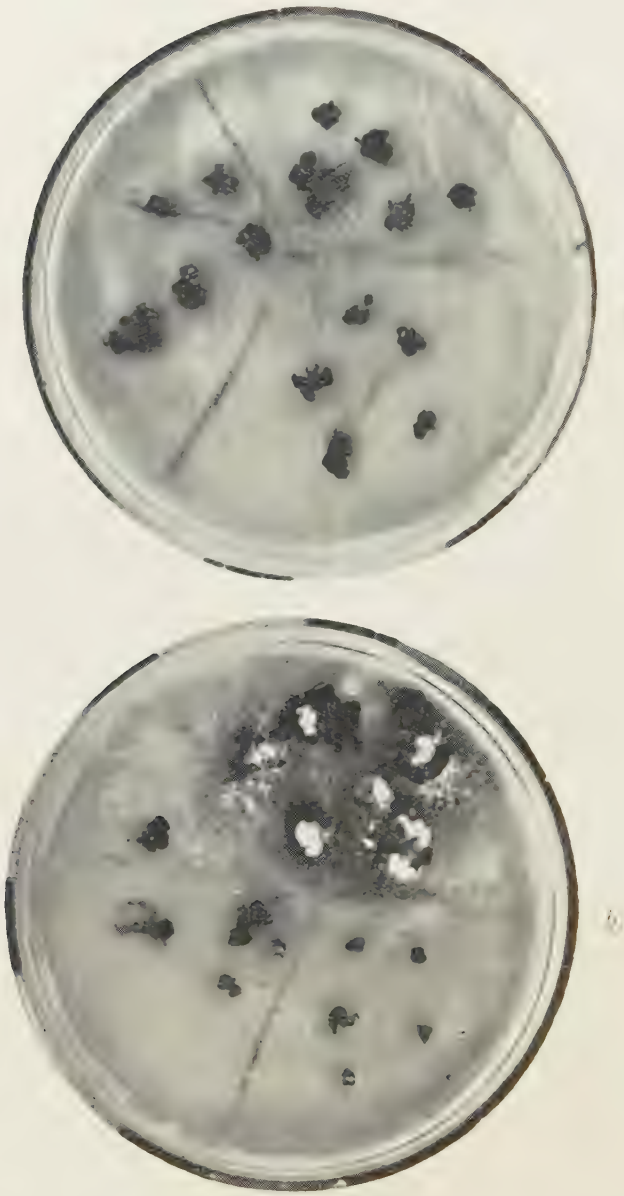


FIG. 2 SCLEROTIA OF CORTICIUM-DISEASE ON CULTURE-MEDIA.

(*a*) No growth—100 per cent. control; (*b*) partial control. The tubers from which these sclerotia were obtained had been soaked for ninety minutes in a 1–1000 mercuric-chloride solution.

Photo by H. Drake.

The accompanying Graph 1 shows the results obtained from this experiment. In this and successive graphs the ordinate (vertical lines) show growth of sclerotia, the cipher O representing no growth or total killing, indicating that complete control has been attained; whereas the abscissæ (horizontal lines) represent strengths of the solutions used (unless otherwise stated). The series of curves given represent different times (in minutes) of immersion, acidity of solution, or strength of solutions. From Graph 1 it will be seen that the usual strengths of mercuric chloride recommended (1–1,000 or 1–2,000) do not give favourable results, for total killing is not obtained.

It was considered possible that the erratic nature of the curves obtained resulted from the frequent presence upon the sclerotia of air-bubbles, for it was noted at the time that these often persisted throughout the duration of the experiment. Therefore a second series of experiments was undertaken, in which the same strengths of solutions were used, and the tubers immersed for the same periods of time; but in addition the tubers were first presoaked for sixteen hours in tap water, it being considered that long immersion would tend to dispel the air-bubbles, and, permitting of the ready penetration of the mercuric-chloride solutions, tend to flatten the resultant curves. The time (sixteen hours) was merely an arbitrary one, being chosen for the reason that it would be most convenient to the farmer, who would require merely to place his tubers in water in the evening and have them ready for treatment in the morning.

In Graph 2 are shown the results obtained—results which are unsatisfactory both in point of time and killing, for it will be noted that, even after immersion for ninety minutes, solutions of a greater dilution than 1–750 do not give complete killing.

The latter experiment showed that lack of control was not due to imperfect penetration through interference by air-bubbles, so it was considered that greater concentration of solution might give satisfactory results. Therefore a further series of experiments was undertaken, in which tubers were immersed in various solutions for different times as follows:—

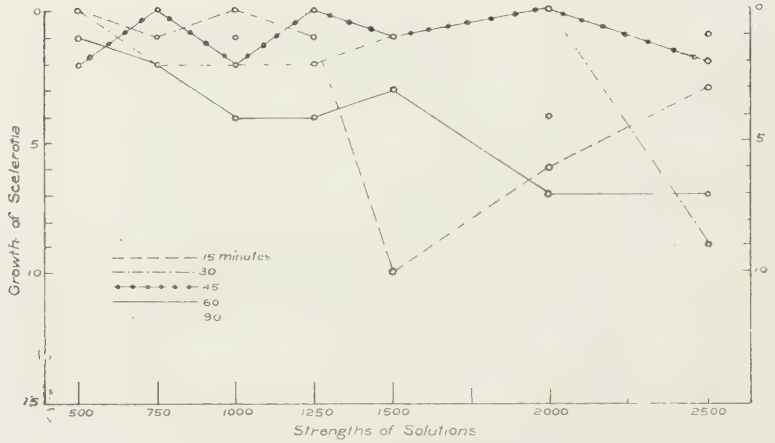
Third experiment—No presoak.
Fourth experiment—Presoak sixteen hours.
Solutions—Mercuric chloride, 1–200, 1–300, 1–400, 1–500, 1–750, 1–1,000.
Times of immersion—15, 30, 45, 60, 90, 130 minutes.

Results obtained showed that in Experiment 4 complete killing was obtained with solutions 1–200 to 1–500 (or 1–200 to 1–400 in Experiment 3) after immersion for two hours, but solutions weaker than this failed to give complete control. As the cost factor was considered to be such that solutions of 1–200 to 1–500 would be too expensive to use, a further series of experiments was undertaken in which solutions of Uspulun and copper sulphate were tried.

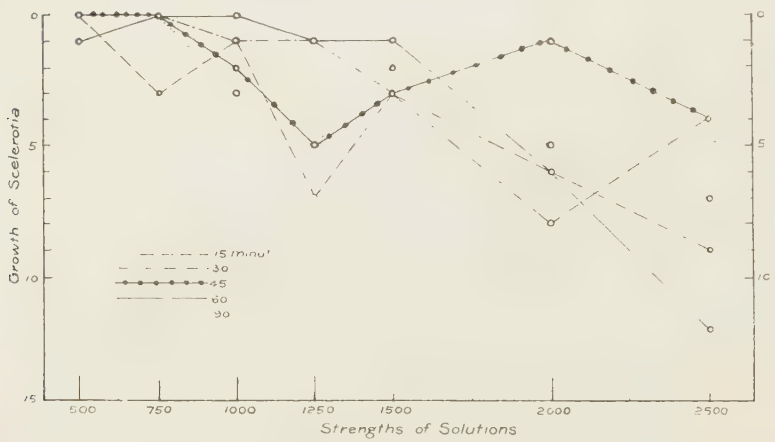
USPULUN.

This is a mercury-chloro-phenol compound, widely used to-day for the treatment of seed-wheat as a preventive of stinking-smut. In the experiment the following strengths of solution and times of immersion were used:—

Solution—1–400 (standard), 1–500, 1–600, 1–750, 1–1,000.
Times of immersion—15, 30, 45, 60, 90, 120 minutes.



GRAPH I. NO PRESOAK. MERCURIC-CHLORIDE TREATMENTS.



GRAPH 2. PRESOAK SIXTEEN HOURS. MERCURIC-CHLORIDE TREATMENTS.

These curves (time curves) show the effects of time of immersion and dilution of solutions on the killing of sclerotia.

Graph 3 (which differs from the preceding two in that the abscissæ give times of immersion in minutes and the curves strength of solution) shows that even after two hours' immersion 1–400 failed to give satisfactory control. Solutions 1–750 and 1–1,000 had no effect, for after two hours' immersion 100 per cent. growth was obtained from treated sclerotia.

COPPER SULPHATE ($CuSO_4$).

Preliminary experiments with this fungicide gave every promise that it would prove a satisfactory if somewhat slower reagent than

GRAPH 3. "USPULUN" TREATMENTS.

These curves (solution curves) show the effects of different solutions on the growth of sclerotia. At no time is complete killing attained.

GRAPH 4. COPPER-SULPHATE TREATMENTS.

This curve shows the effect of sixteen hours' immersion in various solutions of copper sulphate.

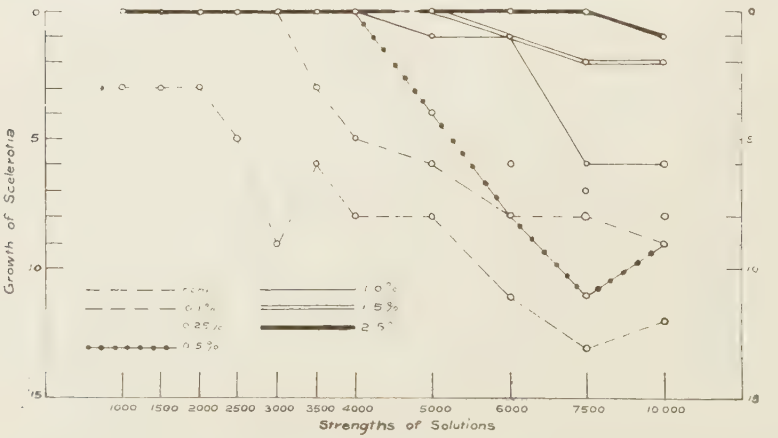
mercuric chloride. Therefore a series of experiments was undertaken, in which tubers were immersed for sixteen hours in the following solutions: 1–100, 1–200, 1–300, 1–400, 1–500, 1–600, 1–750, 1–1,000, 1–1,500, 1–2,000. Graph 4 shows that even after this long immersion 1–100, the strongest solution used, would not completely kill all the sclerotia. In this last experiment nine tubers were used for each phase, instead of three as formerly. As these two compounds gave such unsatisfactory results, further experiments were undertaken with mercuric chloride.

MERCURIC CHLORIDE (FURTHER SERIES).

In the next experiment (No. 17) tubers were immersed for sixteen hours (as in the previous experiment) at the following strengths: Mercuric chloride — 1–500, 1–750, 1–1,000, 1–1,250, 1–5,000, 1–1,750, 1–2,000, 1–2,500, 1–3,000, 1–3,500, 1–4,000. Graph 5 gives a curve of the results obtained. It will be noted that even after sixteen hours' immersion solutions of a weaker concentration than 1,–1,250 did not give complete killing, thus demonstrating forcibly the fact that one of the standard treatments widely recommended — namely, immersion for two hours in 1-2,000—is ineffective.

GRAPH 5. MERCURIC-CHLORIDE TREATMENTS.

This curve shows the effect of sixteen hours' immersion in various solutions of mercuric chloride. Only solutions 1–500 to 1–1,250 give complete killing.



GRAPH 6. ACIDIFIED MERCURIC-CHLORIDE TREATMENTS.

Each curve (save the first) represents a different percentage of acid added to the solutions. Time of immersion, 2 hours.

As the result of a chemical and physical study of mercuric-chloride solutions it was decided to determine the effect of acidity upon their killing properties. Preliminary experiments gave such promising results that a wide series was planned. In the next experiment (No. 21) strengths of mercuric-chloride solutions were used as follows: 1–1,000, 1–1,500, 1–2,000, 1–2,500, 1–3,000, 1–3,500, 1–4,000, 1–5,000, 1–6,000, 1–7,500, 1–10,000. Each solution was made up in seven vessels, and to each was added hydrochloric acid (commercial concentrated, 31·5 per cent.) at the following percentage strengths: None, 0·1 per cent., 0·25 per cent., 0·5 per cent., 1·0 per cent., 1·5 per cent., 2·5 per cent.

Concurrently with this was run another experiment (No. 20) to determine the effect of hydrochloric acid alone on the growth of sclerotia. Tubers, in lots of three, were immersed for two hours in vessels containing water to which the following percentages of acid had been added:—

HCl—*a*, none; *b*, 0·1; *c*, 0·25; *d*, 0·5; *e*, 1·0; *f*, 1·5; *g*, 2·5.

When the cultures were examined twenty-four hours later it was seen that all sclerotia from tubers immersed in solutions *a* to *e* respectively were alive, while ten (out of fifteen) in *f*, and none in *g*, had germinated. In forty-eight hours all the sclerotia in *f* and *g* had germinated. Thus even a 2·5 per cent. solution of hydrochloric acid has little effect upon sclerotia other than to retard their germination for twenty-four hours. Therefore it may be asserted that the acid alone has no effect upon the germination of sclerotia.

In Graph 6 are given the results of Experiment 21. Here it will be noted that although unacidified solutions do not kill at any of the strengths used, when as little as 0·1 per cent. of hydrochloric acid is added killing is obtained even at a strength of 1–3,000. It will be noted that there is a definite relationship between the amount of acid added and the killing of sclerotia.

Further experiments have been carried out with regard to this work. These will appear in a subsequent paper, in which also will be given the cheapest and most economic method of control of corticium-disease.

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(To be continued.)

WAX COATING OF CHEESE.

A RECENT TRIAL SHIPMENT.

W. E. GWILLIM, Assistant Director of the Dairy Division.

It is a common practice in the United States to coat with paraffin-wax cheese required for the domestic trade. The method was first introduced as a preventive measure against cheese-flies and the undue growth of mould. Incidentally it was found that the flavour of the cheese held better, and there was less loss in weight due to shrinkage. Some experimental work was carried out here several years ago, and a trial shipment of wax-coated cheese was made to the British market, but the results achieved did not appear to be sufficient to encourage further effort.

The method is not universally approved by the trade in Britain. Some traders have a prejudice against wax-coated cheese, which is attributed to the idea that when such cheese is cut up into pieces and exposed for sale the loss in weight is greater than with cheese which has not been so treated. On the other hand, many traders prefer wax-coated cheese, and will buy it whenever opportunity offers, provided the quality is right. A considerable amount of trade is done each season in wax-coated Canadian cheese. The buyers appear to be those who thoroughly mature their cheese before sale.

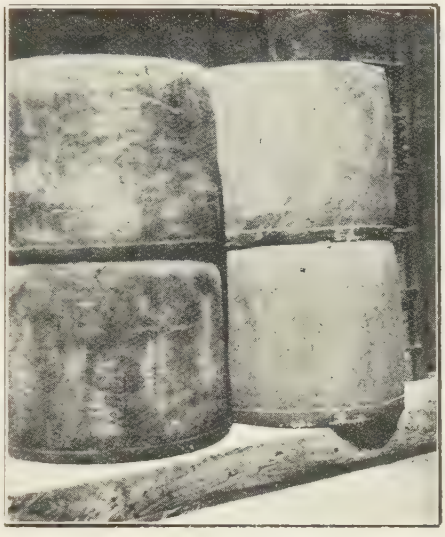
In February last a trial was undertaken in co-operation with the Kiritaki Co-operative Dairy Company (Hawke's Bay) for the purpose of obtaining further data as to the acceptability of wax-coated cheese on the British market, and ascertaining to what extent the wax coating affected the quality of the cheese in regard to the flavour and body, and on the mould-growth and saving in loss of weight. A number of cheeses were taken from three vats each day for seven days, and, after having been on the shelves for about fourteen days, one half of the number from each vat were coated with wax and the other half left unwaxed. The cheeses were duly forwarded to the grading-stores and graded in the usual way. The score-points awarded for quality and finish were the same in each case—namely, 44½ for flavour, 28½ for body and texture, 15 for colour, and 5 for finish, making a total of 93 points. The cheeses were uncased and weighed to the nearest ounce. Two months later the cheeses were regraded and reweighed singly in London by our Inspector, Mr. W. Wright. He reported as follows:—

"No cracked lips are visible on the paraffined cheese, and it seems as though the paraffining would solve the problem of preventing the cracking of the lips of the cheese made in the type of hoop in general use. The cheese can be made very pleasing for the counter trade, as the mould-growth is easily removed with a cloth. The cheese have taken and are holding the wax very well indeed. On no cheese has there been any flaking-off or breaking-away of the wax from the bandage. Each cheese was judged separately for quality, and the points averaged out as follows: Waxed cheese (nineteen crates)—43·94 points for flavour, 28·25 points for body and texture, 14·94 points

for colour; unwaxed cheese (nineteen crates)—43·23 points, 28·10 points, and 14·84 points respectively."

The loss in weight between the time the cheese was weighed in Wellington and reweighed in London was 0·56 per cent. in the waxed cheese and 1·54 per cent. in the unwaxed cheese. Arrangements had been made with the Kiritaki Dairy Company's selling agents in England to pass the cheese on to buyers specially interested in wax-coated cheese, but the arrangement could not be adhered to, as the cheese was selected to form part of the display of New Zealand dairy-products at the Wembley Exhibition.

As far as this trial was carried out it is evident that wax coating helps the quality of the cheese, minimizes mould-growth, and reduces shrinkage. Of these advantages the arrest of mould-growth is not the least important. On bare markets a little mould, and more especially that of a light-bluish colour, may pass without special comment, but on well-supplied markets it may be viewed disparagingly and to the disadvantage of the seller.



SOME OF THE KIRITAKI CHEESE IN LONDON.

To left, unwaxed; to right, waxed.

[Photo by W. Wright.

The coating of cheese with paraffin-wax is not a costly item. The wax used for the trial in question was purchased in Canada at about 3½d. per pound, and each cheese took about 3 oz. of wax. The plant used was a small vat fitted with a coil of steam-pipes, and cost £4 5s. About 100 lb. of wax was placed in the vat, and brought to and held at a temperature of about 210° F. Each cheese was dipped in the molten wax, held in it for about twenty seconds, and then withdrawn. Wax coating appears to be well worth the attention of manufacturers of cheese of the highest quality for sale on the British markets.

Persons employed on Farms.—According to a recently issued report of the Census and Statistics Office the number of persons employed on farms in New Zealand in 1923-24 was 145,158, compared with 146,380 in the preceding year. The figures for 1923–24 are classified as follows: Agricultural, 12,047 males, 2,785 females; dairying, 53,540 males, 24,605 females; pastoral and unspecified, 41,351 males, 10,830 females. "Persons employed" include working proprietors or managers and such members of their families as are employed during the major part of their time on the work of the farm. The persons enumerated are those regularly employed in rural pursuits. No attempt has been made to include temporary workers employed during harvest.

NOTES ON SOME MANURIAL EXPERIMENTS IN CANTERBURY AND OTAGO.

F. W. HILGENDORF, D.Sc., Canterbury Agricultural College, Lincoln.

In past years the Department of Agriculture made a great number of manurial and variety experiments in co-operation with farmers in many localities. The following notes refer to a series conducted in the South Island, chiefly by Mr. A. Macpherson, during the years 1911–16. A uniform plan of operations was followed until the war made certain manures scarce, and then the modification was the least possible. The trials were made on about a hundred farms, chiefly in Canterbury and Otago, and they lasted, as already indicated, for five seasons. By this means some very valuable figures were obtained, and any mistakes or inaccuracies due to soil or seasonal variations will have been smoothed out by the large number of the trials averaged in the following tables. By the use of tables of probability, too, any abnormal variations are taken account of, so that great confidence may be felt that the results of these trials will be reflected on the average of a series of years on a farm having the average soil and climate of the districts in which the trials were made.

Records of the experiments were published in various issues of the *Journal* during the period in question, and are indexed in the half-yearly volumes, also separately in the Consolidated Index for 1910–20 under the general heading of "Co-operative Field Experiments."

There is introduced into the tables that follow a column that requires some explanation. It is called "Odds in Favour of Significance." In any experiment repeated trials will give various results. For example, if one tosses six coins there may come up four heads or two heads instead of the expected three. The average of the first ten throws may be 3·5 or 2·5 heads, and yet the coins be quite normal. If this is so, then differences between 2·5 and 3·5 in an average of ten coin-tossing experiments do not mean anything, are merely chance, or, to use the common term, are not "significant." If, however, we tossed the six coins a thousand times and found then that on the average 3·5 or 2·5 heads had turned up at each throw, we would be justified in saying that there was a real difference between the chances of heads and tails turning up—that the difference between the number of heads and tails in the trials meant something, or was "significant"; and inspection would probably prove that some of the coins were heavier on one side than on the other. On observations such as these there has been built up a Theory of Probabilities, by which one can measure the chances that the difference shown between two series of experiments is a real one due to the different manure or variety, or only an accidental one due to variations in soil, seeding, weighing, recording, &c. It is these chances that have been calculated and entered in the column referred to. Odds of over 30 to 1 are regarded as practical certainty.

TURNIP MANURIAL TRIALS.

Those under consideration were conducted on five farms in Canterbury and forty-nine in Otago in the years 1911–16. In the cases where the same farm was used in two different years it is counted as two farms. In every case considered six plots were tried on the same farm, every series containing one unmanured plot, one with 1½ cwt. superphosphate, and so on. The results are given in tons per acre of roots alone, and the method of computation was that known as "Student's,"* each other plot being differenced against 1½ cwt. super, as that manuring may be considered standard practice. Plot 6 is, however, contrasted with Plot 5 for a reason obvious on examination.

Manure.	Number of Trials.	Yield.	Gain or Loss on 1½ cwt. Super.	Odds in Favour of Significance.
(1.) No manure	54	12·8	9·0 tons loss	Thousands to 1
(2.) 2 cwt. guano	54	20·6	1·2 tons loss	5 to 1
(3.) 1½ cwt. super	54	21·8	..	..
(4.) 3 cwt. super	54	22·4	0·6 tons gain	9 to 1
(5.) 2 cwt. super, plus ¾ cwt. bonedust	54	22·8	1·0 tons gain	24 to 1
(6.) No. 5, plus ¼ cwt. sulphate of potash	54	22·7	0·1 loss on No. 5	1½ to 1

The great increase due to the use of 1½ cwt. super, or, rather, the great loss from not using super, is in accord with universal experience. The 2 cwt. guano gives less than super, and the chances are 5 to 1 that the difference is a real one. The 3 cwt. super gives an increase on 1½ cwt., but the chances in favour of significance are not large enough to allow a recommendation to adopt the practice. It was thought that by taking the results out separately for the wetter districts the 3 cwt. might show to greater advantage, but the information regarding the rainfall during the growing season was not obtainable, and computions from average yearly rainfalls gave no result.

A dressing of 2 cwt. super plus ¾ cwt. bonedust gave an increase of 1 ton per acre over 1½ cwt. super, and the chances are 24 to 1 that the difference is not due to the chance variations of the experiment, but is a real one that would be repeated under similar circumstances. Such odds in its favour cause this experiment to be worth very serious consideration. Of course it is impossible to say whether the increase is due to the added super or to the bonedust, but the absence of marked effect from the 3 cwt. super should cause the bonedust to be regarded with attention. The indications are that of the manures tried in this series 1½ cwt. to 2 cwt. super plus ½ cwt. of a slow-acting phosphate, such as bonedust or guano, will give the best results on turnips in Otago. It is a question for each individual farmer whether the extra ton of turnips per acre will pay for the increased manure.

The addition of potash gave no increase in yield.

A future article will deal with the manurial trials on other crops.

* An explanatory statement on this method by Dr. Hilgendorf is appended (next page), more particularly for the information of other experimenters or instructors.—EDITOR.

"STUDENT'S" METHOD OF COMPUTING PROBABLE ERROR IN AGRICULTURAL EXPERIMENTS.

F. W. HILGENDORF, D.Sc.

One of the best ways of conducting those agricultural experiments in which cumulative effect is not a prime consideration is to attack small questions one at a time, and lay out paired trials of the standard method *versus* the innovation, either in adjacent parts of the same field, or on different fields or farms, or in different years. In this way a great number of replicates can be made at once so as to reduce probable error, and soil variations are largely eliminated, since the two members of each pair of trials are on very similar soil. The differences only are computed, the actual yields of the two members of the pairs being of no direct interest.

For the past two years at Lincoln we have made large use of Beaven's half-drill strip method for this purpose, and find it conducive to accuracy of results combined with rapidity of handling. The middle coulter of the drill is blocked up, and half the drill is filled with each of the two varieties or manures. The drill is then driven wheel on wheel-mark up and down the field, and the result is that one gets pairs of plots sown for as long as one keeps drilling. We find from twenty to thirty pairs usually sufficient.

For computing the probable error of [the difference between] paired trials "Student's" method is very suitable, because it is based on an estimation of the differences, which is what the experimenter is interested in, and because it takes cognizance of the correlation that exists between the members of each pair.

The method is adapted to any kind of paired experiments that can be devised, and so has been used for the manurial trials recorded elsewhere in this issue of the *Journal*, any two trials made on one farm in one year being regarded as a pair. The calculation is as follows: Find the difference between each pair of plots; enter each difference with its appropriate arithmetical sign. Find the mean difference M, with its arithmetical sign; find the difference d of each difference from the mean difference (their total = O), and finally square each d. Then, if n is the number of variates, the standard deviation $\sigma = \sqrt{\frac{\Sigma d^2}{n}}$ and $Z = \frac{M}{\sigma}$. The odds can then be found from the table appended. It will be noted that the factor ·67 used for turning standard deviation into probable error is not introduced. It has no particular advantage, and must not be used in conjunction with the table here quoted.

Example.

To find difference and the odds in favour of its significance between two manures applied to turnips on each of six farms:—

Year or Farm.	2 cwt. Guano.	1½ cwt. Super.	Difference.	d = Difference from Mean.	d^2.
A ..	10·21	9·61	−0·60	−1·28	1·638
B ..	26·82	31·80	+4·98	+4·30	18·490
C ..	9·43	8·42	−1·01	−1·69	2·856
D ..	27·11	27·22	+0·11	−0·57	·325
E ..	9·27	10·41	+1·14	+0·46	·212
F ..	24·21	23·67	−0·54	−1·22	1·488
Total ..	107·05	111·13	..	0·00	25·009
Difference	..	4·08	+4·08	..	..
Mean = M	..	..	+0·68	..	..

$$\sigma = \sqrt{\frac{25{\cdot}009}{6}} = 2{\cdot}04$$

$$Z = \frac{{\cdot}68}{2{\cdot}04} = {\cdot}33$$

and odds are by attached table about 4 to 1 that the difference is significant.

Skeleton Table of Odds for Z Values estimated by "Student's" Method.
(n = number of variates.)

Z.	$n = 5$.	$n = 7$.	$n = 10$.	$n = 12$.	$n = 15$.	$n = 17$.	$n = 20$.	$n = 25$.	$n = 30$.
0·2	1·82	2·12	2·55	2·84	3·29	3·60	4·08	4·94	5·90
0·4	3·27	4·48	6·67	8·45	11·8	14·5	19·5	31·4	49·3
0·6	5·75	9·42	18·0	26·8	47·3	68·4	117	277	666
0·8	9·82	19·5	49·3	88·3	207	356	832	3,332	9,999+
1·0	16·2	39·2	132	293	908	1,999	9,999+	9,999+	
1·2	25·9	75·9	344	908	3,332	9,999+			
1·4	35·8	119	666	3,332	9,999+				
1·6	60·0	255	1,999	9,999+					
1·8	86·7	434	4,999						
2·0	122	713	9,999+						
2·2	168	1,249	9,999+						
2·4	232	1,999	9,999+						

Some Cases of Practical Certainty.

$Z = {\cdot}7$	$n = 12$	odds = 48·5
$Z = {\cdot}5$	$n = 20$	odds = 46·4
$Z = {\cdot}45$	$n = 25$	odds = 46·6

A much fuller table is given by H. H. Love, *Jour. Am. Soc. Agronomy*, vol. xvi, No. 1, 1924, p. 68.

FRUIT CONTROL ACT POLLS.

POLLS of producers taken during December with respect to bringing into operation the provisions of the Fruit Control Act, 1924, resulted in the First Part of the Act, relating to export control, being carried by a majority of 151 votes. The number of eligible votes was 291, of which 191 voted for and 40 against the proposal.

With respect to provincial control for fruit intended for sale on New Zealand markets, this proposal was negatived in each province as per the following figures:—

Province.	Eligible Electors.	Quota required.	Votes cast for Proposal.	Votes cast against Proposal.
Auckland	803	482	92	407
Taranaki	11	7	1	4
Hawke's Bay	373	224	54	92
Wellington	151	91	15	87
Marlborough	72	44	17	13
Nelson	590	355	279	147
Canterbury	356	214	21	214
Otago	361	217	32	123

Three informal votes were cast in Auckland and one in Nelson.

Although Nelson Province polled a large majority in favour of the proposal, the requisite 60 per cent. of eligible electors in favour was not obtained.

KIKUYU-GRASS IN AUCKLAND PROVINCE.

COMPARISON WITH PASPALUM.

A. G. ELLIOTT, Department of Agriculture, Auckland.

KIKUYU-GRASS (*Pennisetum clandestinum*) is a native of the Belgian Congo, and is now found generally in the African provinces. In Rhodesia it is one of the principal grasses, and is used in both pastures and playing-fields. The *Agricultural Gazette of New South Wales* for May, 1921, published a very comprehensive account of kikuyu, by J. N. Whittet, under the name of *Pennisetum longistylum*, but it was later established by E. R. Breakwell that the species mentioned was really *clandestinum*. In his recently published book, "The Grasses and Fodder Plants of New South Wales," Breakwell gives the history and quality of kikuyu both under Australian and African conditions.

FIG. 1. KIKUYU-GRASS, SHOWING ROOT-SYSTEM, CREEPING STEMS, ETC.

The *longistylum* species was noticed over ten years ago by Mr. E. M. Ellin, growing vigorously on the sides of the Kiripaka Road, near Whangarei. Here it produces a quantity of coarse feed in the summer months, which even travelling stock will not touch. The grass is spreading both by seed and by surface and underground runners, but it is of practically no economic value, and may be classed among the so-called weed grasses. True kikuyu may be readily distinguished from the *longistylum* species not only by the quantity of feed produced, but also by the fact that while the former produces only a very reduced form of inflorescence and sets no seed, the latter has a good flowering-head and also seeds. *Pennisetum longistylum* was introduced here many years ago by a local nurseryman, Mr. David Hay, and it has also been identified growing in Victoria Avenue, Auckland. At the Ruakura Farm of Instruction the weed grass was also tried, but its small economic value was soon demonstrated wherever it was grown.

Kikuyu is a quick grower, spreading rapidly by means of surface and underground runners and an extensive root-system. It has the twitch habit of growth, and by this rapid production of new plants, especially from those roots which occur at the nodes on the surface runners, soon covers a large area. Fig. 1 shows these features and the

quantity of leafage thrown by this grass. In the issues of this *Journal* for May and October, 1921, December, 1922, and November, 1923, preliminary reports were given on results obtained with kikuyu at Albany and Puwera experimental areas.

INTRODUCTION AND TRIALS AT ALBANY.

Cuttings of kikuyu were introduced into New Zealand from Rhodesia by Mr. M. O'Brien, who was then on the staff of the Agriculture Department, at Wellington, and they were planted out at the Albany Experimental Area, near Auckland, in the spring of 1920. In a few weeks the plants were well established. A number of farmers who visited the area were so favourably impressed with the progress or the grass in the first season that they asked to be supplied with roots for trial. The roots were planted out in rows 3 ft. apart and 3 ft. between the rows, but during the first season this intervening area was covered by the runners. A small dressing of superphosphate was applied at planting, and on this and a larger plot which was laid down the next season an autumn top-dressing of superphosphate and basic slag was regularly applied with good results. Since it does not set seed the only means of propagating kikuyu is by planting of roots, and owing to lack of space, which precluded the carrying-out of more extensive trials at Albany, this centre is now used mainly for the distribution of roots to interested farmers who apply for them.

PUWERA EXPERIMENTS.

Roots forwarded from the Albany plot were planted out at Puwera, with a small amount of superphosphate, during November, 1920, and, as at Albany, the plants soon became well established. Visitors invariably expressed surprise at the vigorous growth of the kikuyu on this class of soil, which is typical of the stiff "pipeclay" gum-land. Experience at Albany had shown that, as with paspalum, the kikuyu becomes root-bound, and also requires top-dressing where it is not grazed by stock. In the second season at Puwera an area in the nursery was laid down with Lodino clover and kikuyu, and another with Lotus major, white clover, and kikuyu. The result was striking, since there was a remarkable improvement in the quality of the feed thrown by the kikuyu, which was very appreciably improved by the association with legumes. Both plots were grazed by a horse, and later cut for hay, which was of good quality and relished by stock. In experiments conducted at Kenya, British East Africa, clovers sown with kikuyu were entirely crowded out, and were only able to show up when the grass sward had been broken up.

FEEDING-TRIALS.

In September, 1922, an area of one acre was planted at Puwera with kikuyu roots, and later surface-sown with a mixture of red clover, white clover, and Lotus major. A good take resulted, and the whole area between the rows was well covered after the first season. This area throws a large quantity of succulent feed, most of which is produced between the months January to April. Figs. 2 and 3 show steers grazing on the plot, and give an indication of the close sward obtained with the kikuyu, Lotus major, and clovers. The cattle keep it closely grazed, and the area is very free from weeds, which

cannot compete with the grass. This plot has been top-dressed each season. In July, 1923, it received a mixture of 3 cwt. per acre of equal parts of superphosphate and basic slag, and in June this year superphosphate was applied at the same rate per acre. The results obtained have been gained by quite normal treatment in regard to stocking and top-dressing, and the cattle turned in on the kikuyu area have evidently found the pasture very palatable.

FIG. 2. STEERS GRAZING ON PASTURE OF KIKUYU, LOTUS MAJOR, AND WHITE CLOVER AT PUWERA EXPERIMENTAL AREA.

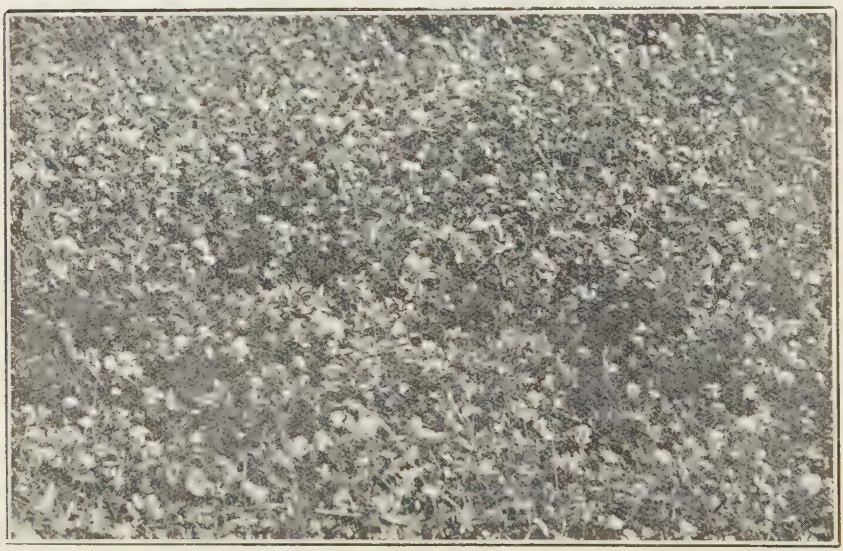


FIG. 3. A CLOSE VIEW OF THE PASTURE SHOWN IN FIG. 2.

WINTER GROWTH.

In order to get the best return from kikuyu it must be top-dressed. The two plots previously mentioned, in the nursery at Puwera, were top-dressed with superphosphate at the rate of 3 cwt. per acre in June, 1923. They were cut for hay in February of the present year, and later top-dressed in the autumn with the same fertilizer at the same acre rate. Fig. 4, the photograph for which was secured at the end of July, shows the vigorous winter growth of the kikuyu, which is usually regarded as a summer grass. This growth of the grass and the associated legumes is undoubtedly influenced by the phosphate top-dressing. When the cold, wet winter which was experienced at Puwera this year is taken into account it is evident

FIG. 4. WINTER GROWTH OF KIKUYU AND CLOVERS AT PUWERA.

that the result gained was in no way due to favourable climatic conditions. From experience gained since 1920 kikuyu had been of use only as a summer grass, having proved to be a good drought-resister and doing well on the poorer soils where English grasses could not be established. Its season, extending from October to May, was against its general use on dairy farms ; but if the winter growth obtained this year at Puwera can be relied on the value of kikuyu for North Auckland conditions will be greatly increased. Farmers' experience bears this out.

COMPARISON WITH PASPALUM.

At Puwera a further area of an acre was laid down in paspalum and white clover near the kikuyu area, and a third plot with paspalum

and cow-grass. The cattle have grazed these as well as the kikuyu plot, but have shown no very decided preference for any one plot. Kikuyu was much quicker and easier to establish than was paspalum, which at Puwera usually takes two years to become a good pasture-grass. The main requirement in North Auckland, apart from winter feed, is to provide sufficient grass and supplementary feed to carry dairy cows and other stock over the usually dry months of December, January, and February, and kikuyu was tested with this fact, among others, in view. Previously paspalum had provided in most cases the only feed for the dry period, and it was often the only sign of green to be seen at the time. The short season of paspalum, even under top-dressed conditions, is a very serious objection, unless it is kept well under control and used as a summer and autumn grass only. On the majority of farms it is not controlled at all, and yet for practically eight months of the year it does not produce succulent feed. In the Kaitaia district, in many cases, farmers have practised "fogging" instead of haymaking. Under this method the stock are turned in on the dry paspalum, which is often over 8 ft. high, and left to chew up the dried stalks and very small amount of short leaves. Under Puwera conditions kikuyu is quite as nutritious as paspalum, and in addition to this it has a longer growing-period

There is extra trouble involved in laying down an area in kikuyu, since roots must be either ploughed in or planted by hand, while in the case of paspalum seed (the average germination of which is about 30 per cent.) is usually sown. On the other hand, kikuyu is much quicker to establish than is paspalum, and also there is no danger of it spreading all over the farm by means of seed distributed in various ways by animals. In laying down a field in what is later intended to be a pasture consisting mainly of paspalum one of two methods is usually adopted. The most successful is to sow the paspalum-seed in the spring, together with clovers and Lotus major, and in this way quite a good sward is obtained for the second season. This method has proved very successful at Albany Experimental Area. Under the second method paspalum-seed is included in an autumn-sown mixture containing temporary and permanent elements, both of which must be used in just sufficient quantity to provide early feed and cover the ground, but not to depress the growth of the paspalum seedlings. Many areas intended for paspalum pastures in North Auckland have never done well owing entirely to the fact that too much Italian rye-grass was included in the mixture, and this strong temporary element crowded out the paspalum seedlings, which do not appear until the spring. Thus the special paspalum pasture was never a success on such areas, as subsequent top-dressing only assisted the more permanent elements, and also brought along such weed grasses and weeds which came in after the temporary grasses had run out.

To sum up the comparison, results to date show that kikuyu, under North Auckland conditions, produces a quantity of feed which is quite equal to that yielded by paspalum, and that it has a longer growing-period than the latter. Its ability to flourish on the poor clay hills where weeds cannot compete with it is also another advantage kikuyu has over paspalum, while the two points previously referred to—namely, its quick establishment and seedless habit—should also be kept in mind.

FARMERS' TRIALS.

During the last four years roots of kikuyu have been sent out to farmers who applied for them, and over ninety lots of cuttings have been distributed in this manner. Each season reports have been sent in by most of these men, and since the climate over the area from Kaitaia to Taumarunui varies a good deal, so the successes and failures with the grass have alternated. As would only be expected with a grass introduced from a tropical country, kikuyu did best under the warm conditions of North Auckland. In most places in South Auckland where it was tried, although producing feed by the middle of the first summer, it never recovered from the frosts. The majority of farmers in the northern districts who have tried kikuyu are very pleased with it, and they report that stock does well on the grass. In its second and third season many farmers had secured enough cuttings from their original supply to plant out a large area, and even now requests are received from farmers who wish to put down areas of from 5 to 10 acres.

Where it was tried in cultivated ground, however, the kikuyu soon became quite a menace to the other plants in the vicinity, and it was very difficult to eradicate. In two seasons a few roots, planted at a distance of 3 ft. apart, had covered an area 15 ft. long by 6 ft. wide. From its habit of growth one would expect to find this result, so that kikuyu should never be planted on such ground, but should be used on the poorer classes of soil where other grasses will not hold. On poor clay hills, where farmers report that it can be established, kikuyu should do well and throw a quantity of good feed, since the surface-sowing of Lotus major and white clover is an easy matter. Already on this class of country two species of Lotus occur naturally, and, as is shown at Puwera, the association of these with kikuyu gives a good sward.

EXPERIENCE IN OTHER COUNTRIES.

In the *Agricultural Gazette of New South Wales* for May, 1921, Whittet gives a good account of the trials with kikuyu in New South Wales, and also describes feeding-experiments which were carried out at Hawkesbury Agricultural College. In these latter trials kikuyu was found to be next to Hungarian brome in palatability, but was ahead of both timothy and cocksfoot. In this determination the grasses were cut and fed green to dairy cows for a certain period. Trials generally in New South Wales and Western Australia show that kikuyu does well in a variety of soils and climatic conditions, and produces most of its feed in the summer months. In the winter it lies dormant, but has proved to be a good drought-resister in summer. Roots were sent to Fiji from the Albany Experimental Area; reports show that the kikuyu is doing well on dairy farms, and it is expected that if the present successful sward can be maintained kikuyu will become one of the most important grasses there. Cuttings of roots were also forwarded to the Experiment Station at Honolulu, and the first report stated that the grass had become well established there.

CONCLUSIONS.

Kikuyu does well under the soil and climatic conditions of a great part of the Auckland Province, and is particularly suited to the Northern

Peninsula. Although most of the palatable feed is thrown between the months of December and April, by top-dressing with a phosphatic fertilizer a succulent winter growth is produced. The best results obtained from kikuyu have been gained where it has been used in association with a legume, white clover and Lotus major being the two most commonly sown. This pasture can be grazed, cut and fed green, or made into hay, which stock relish. Kikuyu stands drought well, and in addition to this it is able to successfully compete against young fern and manuka which come in on areas where reversion is taking place. Such reversion is common in North Auckland, and kikuyu may be an important factor in bringing what is now waste land into a state of production. If planted out in the spring the grass soon becomes well established and spreads rapidly. Once stock graze over these now useless areas the soil would be improved, the growth of fern and manuka checked, and the spread of the kikuyu assisted by the action of droppings. Under the conditions of Auckland Province kikuyu should be planted out only on such areas as cannot carry English grasses. As it is easily propagated from a small supply of roots the grass can in a few seasons be laid down wherever desired on the farm.

Further experiments in connection with grazing and top-dressing kikuyu are being carried out at Puwera this season. A large number of applications have been also received from farmers who wish to give the grass a trial this spring. Roots are distributed free in these cases, and reports are obtained from time to time from the farmers as to the value of the grass in their particular districts.

The conclusions drawn must be regarded as tentative for the present. Further results will be published after the trials have been continued over several seasons.

INVENTIONS OF AGRICULTURAL INTEREST.

Applications for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 13th November to 17th December, 1924, include the following of agricultural interest:—

No. 49657: Fertilizer; A. A. Adams, Auckland. No. 50017: Milking-machine measuring attachment; G. Harvey, Rata. No. 50446: Meat, fruit, and vegetables preservation; J. Cuthbertson, London, England. No. 50897: Ploughshare; C. H. Ensor, Rangiora. No. 51136: Plough; P. R. Spurr, Waitara. No. 51197: Plough-seat; W. Y. Cunningham, Gore. No. 52522: Dehorning-machine; P. J. Abraham, Ballygowan, Ireland. No. 51522: Cream-cooler; J. M. McDonald, Te Puke. No. 51263: Sheep-shearing machine adapter-plate; F. G. W. Bristow, Auckland. No. 51344: Driving-gear for separators; Massey-Harris Co., Ltd., Toronto. No. 52463: Wool-pack gripper; J. Kinlock, Timaru. No. 52737: Shearing-machine hand-piece tension-distributing means; C. H. Davis, Inverell, N.S.W. No. 52738: Hoe or seed-drill boot; C. Hunt, Beulah West, Vic. No. 52792: Harrow-link connection; S. J. Harding, Hinuera. No. 50627: Fruit-case; J. Brown, Birkdale. No. 51107: Incubator egg-tray; H. J. C. Williams, Christchurch. No. 51301: Milk-churn closure; E. Stanley, London, Eng. No. 51383: Milking-machine air-admission device; D. A. Hawken, Maunu. No. 52891: Butter-making process; Milk Oil Corporation, Wilmington, U.S.A. No. 53000: Rabbit-trap; J. Murray, Canberra, N.S.W.

Copy of full specifications and drawings in respect of any of the above may be obtained from the Registrar of Patents, Wellington. Price, 1s.

FARMYARD MANURE.

ITS CONSERVATION AND UTILIZATION.

W. J. McCULLOCH, Instructor in Agriculture, Palmerston North.

THE question which probably most exercises the mind of the average New Zealand farmer in regard to the use of farmyard manure is, "Does its fertilizing-value justify the expenditure of labour in conserving and subsequent utilization?" As the climatic conditions of this country do not demand that farm-animals should be housed continuously for lengthy periods each season, the quantity of manure collected at the average steading is relatively small. It is therefore very evident that the stock themselves are responsible for the distribution of the bulk of the manure, and in this way contribute very largely to the fertility upkeep of our farm lands. Hence also the value of using the tripod harrows at short intervals on the low-country pastures. This is plainly the most economical method of handling animal-manures.

In a consideration of the value of farmyard manure due allowance must be made for more than the actual commercial value of its fertilizing ingredients. It must be clear that the fertility of a soil is dependent upon more than the addition of so-called plant-foods. For instance, the humus content, which is one of the most important factors in fertility upkeep, can be largely depleted by the production of annual crops which are almost entirely removed. In order to be quite clear on the position one must first recognize that there is a distinction between what are known as manures and those termed artificial fertilizers, the chief difference being in respect to the other important functions of, for example, farmyard manure. For while an organic manure supplies plant-food, it also aids in the general improvement of plant-foods already in the soil to a very marked degree, while the artificial fertilizer as a rule only furnishes plant-food.

Another important factor of all fertile soils is texture, and here again farmyard manure exerts a very beneficial influence. The mechanical and physical benefits derived by soil from an addition of such manure are very important. The benefits extend alike to light and heavy soils. In light soils organic matter—frequently so deficient, and which no amount of artificial fertilizer can make up for—is supplied by farmyard manure, while at the same time the latter assists consolidation and retention of moisture. The advantages to heavy clay soils, although in a different direction, are no less marked. It makes their working much easier by opening the soil-mass to the beneficial influences of warmth, aeration, and oxidation. It will therefore be realized that farmyard manure is unique in its effect, and that it must be given credit for more than its actual commercial value as a plant-food.

The value of introducing and encouraging useful soil-bacteria is now well understood, and as an efficient supply of organic matter in a soil is known to be necessary for the growth and well-being of these organisms we realize a further important part played by the addition of farmyard manure. The manurial value of crops fed off on the ground

is universally recognized, yet the fact of the value of properly conserving farmyard manure continues, in many instances, to be neglected.

Much as we appreciate the value of an organic manure, it is often argued that the average New Zealand soils are not yet really deficient in humus, and that the necessity for the proper care and use of farmyard manure can quite easily be left in abeyance meantime. In answer to this statement it has to be remembered that the stables, cow-sheds, and yards must of necessity be kept cleared of manure, but there can be no real reason why it should be dumped in untidy heaps in odd corners and left lying at the mercy of heavy, washing rains, which remove in a liquid form to the nearest drain the most quickly soluble and available plant-foods. Even if it has to be looked upon as a necessary evil it must be handled and, sooner or later, the accumulation carted out and spread on some field. There appears to be no valid reason why a little extra care should not be taken to save the best of the material and utilize it as a fertilizer and soil-improver, while at the same time reducing annual expenditure on artificial fertilizers.

The ideal method would be to spread the manure daily and plough it in; but this may be prohibitive on account of the labour involved, so that storage under reasonably good conditions will be the more convenient method. Where this can be accomplished under cover the value of the manure is greatly enhanced; but this may also be too expensive, so that the manure-heap in the open is likely to be more general. At the outset every attempt must be made to avoid drainage running from the heap, and if a concrete floor with shallow sides is out of the question, then a shallow depression should be scooped out, and if the bottom consists of an impervious clay all the better, as the object is to conserve all liquid. If the subsoil is loose, then a few loads of clay puddled on the bottom of the depression will answer. Should the circumstances prevent the scooping-out of a depression, then a ridge of loose soil can be spread round the outskirts of the heap, and as the moisture becomes absorbed it can be thrown on top of the manure-heap and replaced by more soil. In building the heap it should be kept evenly spread and level on top, consolidating the mass as much as possible in order to avoid undue heating. Horse-manure will heat readily if air is not excluded, especially if combined with too much straw. This causes a great loss of ammonia, and must be avoided as far as possible by mixing with alternate layers of cow or pig manure, or by pumping liquid manure on to the heap. Where none of these methods is practicable, and overheating occurs, a layer of soil should be spread on top of the heap. The soil will absorb most of the ammonia, and by consolidating the heap assist to prevent heating. It has often been suggested that gypsum, superphosphate, or kainit should be used as preventives against loss of ammonia in stables, but though good results have occasionally followed their use it is now recognized that all are open to objection, and they are not recommended. It is preferable to rely on straw or hay as a litter to absorb the moisture.

As an indication of the loss sustained by uncovered manure-heaps compared with those kept under cover, a few experiment-station

results may be here quoted. Rothamsted reports that covered manure increased the yield of potatoes by 7 cwt., and that of wheat by 5 bushels of grain and 4 cwt. of straw per acre. At Woking covered manure increased a wheat crop by 2 bushels of grain and 2 cwt. of straw per acre. The College of Science for Ireland, experimenting with potatoes, dressed two plots with farmyard manure at the rate of 18 tons per acre, one from a covered and the other from an open heap. The yield from the former plot was 9 tons 14¼ cwt. per acre, while that from the latter was 7 tons 14¾ cwt.

Every attempt should be made to save the liquid manure from the shed-drains. This manure should be drained into a tank or shallow concrete well placed below ground-level, and in a convenient position so that it may be pumped to a tank on a dray and directly applied to the field—preferably grassland. If conditions permit it may even be gravitated direct from the drains and used to irrigate the pastures. Failing both these methods it should be pumped on to the manure-heap. On no account should liquid manure be allowed to run to waste, as it contains a very appreciable amount of quickly available plant-food—approximately two-thirds of the total nitrogenous matter and four-fifths of the total potash (the phosphoric acid being mostly contained in the solids). It has been found that 1,500 gallons of liquid manure are equivalent to 150 lb. sulphate of ammonia and 4½ cwt. of kainit.

As an addition to light soils farmyard manure should be well rotted (not firefanged) or what is generally termed "short." On the other hand, it should be "long" or strawy if for use on heavy or clayey soils. The straw which has been used as litter or bedding being more intact in the latter kind tends to keep the soil open, while in the former the well-rotted material brings about consolidation of the soil-mass and assists in retaining moisture, &c. Farmyard manure should rather be distributed over as large an area as is consistent with practical convenience, and so long as the distribution is even and in combination with artificial fertilizers applied separately, it will be found without exception that much better results will be obtained than if larger amounts of either are used separately. Farmyard manure varies much in composition, and although it is often called a complete manure it is not really well balanced, being usually deficient in phosphoric acid. For this reason it should be used in conjunction with one of the artificial phosphatic fertilizers.

As regards the time of year when farmyard manure should be applied, much depends on the circumstances. Where it is desirable to apply it to pastures it should be carted and spread during winter or early spring, and the field thoroughly tripod-harrowed as soon as practicable afterwards. For the growing of green fodders or roots it must be spread and ploughed in early, or some considerable time before sowing. Such crops as chou moellier, maize, thousand-headed kale, &c., being gross feeders, readily respond to an application of farmyard manure. In the case of the potato crop it can be spread between the ridges, together with artificial fertilizer, and the tubers planted, after which the whole will be covered by splitting the drills in the ordinary way.

TESTING OF PUREBRED DAIRY COWS.

DECEMBER CERTIFICATE-OF-RECORD LIST.

W. M. SINGLETON, Director of the Dairy Division.

THE appended list of C.O.R. certificates issued during December includes particulars of a number of creditable performances. Of these, two cows deserve special mention on account of their records constituting class-leaderships, as follows:—

AYRSHIRES.

Ivanhoe Stylish Daisy, a three-year-old Ayrshire which has gained a certificate on the production of 574·09 lb. butterfat, was bred, developed, and tested by Mr. A. M. Weir, of Menzies Ferry, and displaces the previous class-leader—Mr. C. E. C. Webb's Greenfield's Ina—by a margin of 8·07 lb. butterfat. The sire of Ivanhoe Stylish Daisy is Hindsward Jimmy, a bull which is fast making a reputation through the quality of his daughters. In addition to Ivanhoe Stylish Daisy he is sire of Ivanhoe Fancy (713·93 lb. butterfat) and Ivanhoe Fillpail (646·31 lb.), leaders of the four-year-old and mature Ayrshires respectively. Thus Hindsward Jimmy is sire of the leaders of three of the four classes into which this breed is subdivided. He is by the well-known imported sire Oxhill Jimmy. The dam of Ivanhoe Stylish Daisy is Maud of Inglewood, an untested daughter of Dandy Jim of Inglewood, who is by the imported bull Lessnessock Grandeur.

The year just ended has added several good records to the gradually lengthening list of Ayrshire C.O.R. cows, and it is hoped that this will be an incentive to followers of this breed to place purebred females under certificate-of-record test in greater numbers than has been the case in the past.

MILKING SHORTHORNS.

The change in class-leadership for the Milking Shorthorn breed falls in the senior four-year-old class. Matangi Violet 2nd, with 621·54 lb. butterfat, has exceeded the yield of her herd-mate and half-sister Matangi May 2nd by some 47 lb. butterfat. Matangi Violet 2nd was bred and tested by Messrs. Ranstead Bros., and is yet another champion daughter of Dominion Esau of Ruakura.

LIST OF RECORDS.

* Cow milked three times daily during whole lactation period. † Milked three times daily during part of period.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Fox's Golden Lady ..	L. and J. Griffith, Weraroa	1 359	240·5	365	13,998·2	617·54
Lynford Verbena ..	J. Murray, Woodville ..	2 10	241·5	365	10,261·7	562·71
Brooklyn Golden Belle	H. J. Lancaster, Glen Oroua	2 18	242·3	365	9,040·9	531·82
Oaklands Merry Princess	F. W. Cornwall, Bell Block	2 7	241·2	345	8,011·1	508·36
Golden Legend ..	L. and J. Griffith, Weraroa	1 330	240·5	365	11,794·3	497·24
Huimai Nancy Jean..	J. Nicholson, Manakau ..	2 43	244·8	365	8,396·1	497·12

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
Junior Two-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Erinview Flo ..	J. Murray, Woodville ..	2 25	243·0	334	8,638·7	492·22
Keyflower	L. and J. Griffith, Weraroa	1 360	240·5	365	9,069·2	491·76
Waitapu Moral ..	E. Sinclair, Cheltenham ..	1 343	240·5	365	8,717·2	479·66
Riverswood Storm Lady	J. Nicolson, Kaupokonui ..	2 9	241·4	365	8,033·8	478·99
Linden Grove Diamond	M. A. Gadsby, Stratford ..	2 26	243·1	365	8,133·2	474·12
Waitapu Star ..	E. Sinclair, Cheltenham ..	1 285	240·5	365	8,889·8	439·68
Compensation ..	J. Nicolson, Kaupokonui ..	1 304	240·5	365	7,917·0	433·97
Riverswood Butter Girl	J. Nicolson, Kaupokonui ..	1 214	240·5	335	8,731·8	433·20
Holly Bank Maid ..	J. Nicolson, Kaupokonui ..	2 7	241·2	365	8,755·5	432·64
Riverswood Gold Cup	J. Nicolson, Kaupokonui ..	1 230	240·5	365	7,645·9	427·29
Double Duchess ..	A. J. Harris, Bombay ..	2 17	242·2	365	6,759·5	419·19
Rosy Creek Gleam ..	A. and J. O'Donnell, Hawera	1 357	240·5	365	7,108·7	415·01
Glenlivet Little Violet	W. S. Knuckey, Waitara ..	2 13	241·8	365	5·896·5	410·98
Pride Golden Hope ..	R. E. Clements, Awakino Pt.	1 309	240·5	365	6,871·5	409·15
Jersey Lea Trilby ..	L. and J. Griffith, Weraroa	1 317	240·5	365	7,948·2	408·71
Hawthorne Rosebud ..	B. Roberts, Parkvale ..	1 313	240·5	365	6,889·6	403·56
Dorothy Storm ..	A. J. Dempsey, Horsham Downs	2 76	248·1	365	6,687·6	394·79
Ratanui Glory Lass ..	Boon Bros., Poroporo ..	1 346	240·5	359	7,156·5	393·43
Huimai Dianthus ..	J. Nicholson, Manakau ..	1 317	240·5	365	7,709·2	389·09
Vixen's Golden Ray ..	R. E. Clements, Awakino Pt.	2 8	241·3	365	7,435·4	384·23
Milly Merit	F. S. Veale, Cambridge ..	1 328	240·5	365	5,722·9	382·23
Ratanui Zoraida ..	Boon Bros., Poroporo ..	2 24	242·9	355	9,087·0	381·91
Linden Grove Tiny Sunray	M. A. Gadsby, Stratford ..	1 336	240·5	365	7,727·0	381·48
Orange Dale Pearl ..	W. J. Hall, Matatoki ..	1 352	240·5	342	6,652·4	376·75
Waimarie Molly ..	H. G. Livingston, Kiwitea ..	2 2	240·7	347	5,843·5	368·44
Glenlivet Dora ..	D. L. A. Astbury, Mangatoki	2 1	240·6	365	6,453·8	349·91
Hawkesbury Marigold	W. I. Fallows, Puni ..	2 86	249·1	365	6,764·3	340·85
Soumise Buttercup ..	W. E. Wickham, Waitara ..	1 314	240·5	365	6,087·8	334·85
Arthingworth Ngati ..	E. Smallbone, Richmond ..	1 336	240·5	365	6,924·4	325·13
Mabelle Esquilant ..	G. A. Berry, Manaia ..	2 8	241·5	329	5,824·3	317·92
Luxury of Meadowbrook	J. O. J. Oliver, Temuka ..	1 281	240·5	365	5,652·1	296·54
Orange Dale Princess	W. J. Hall, Matatoki ..	2 11	241·6	270	5,155·0	289·62
Senior Two-year-old.						
Woodlands Faith ..	H. C. Sampson, Hillsborough	2 364	276·9	365	10,894·3	709·62
Uruti's Queen ..	W. Oxenham, Uruti ..	2 317	272·2	365	12,003·2	653·11
Llanvabon Briar Girl	L. W. and J. T. Prosser, Leeston	2 360	276·5	365	10,234·5	513·17
Erinview Molina ..	J. Murray, Woodville ..	2 337	274·2	365	11,343·9	506·20
Orange Dale Briar ..	W. J. Hall, Matatoki ..	2 360	276·5	365	8,333·5	427·09
Kuku Betty ..	R. L. Horn, sen., Ohau ..	2 336	274·1	320	8,927·8	404·22
Matai Nui Charmian ..	D. L. A. Astbury, Mangatoki	2 199	260·4	365	7,094·4	389·45
Snowdrop's Hope† ..	J. McIvor, Ohaupo ..	2 325	273·0	365	5,952·6	327·01
Clarice	K. Rothe, Riverlea ..	2 272	267·7	346	6,265·8	309·64
Mauriaena Laura ..	Aickin and McCarroll, Woodhill	2 324	272·9	337	4,897·3	276·14
Three-year-old.						
Viola's Queen Bess ..	R. Cobbe, Aorangi ..	3 282	305·2	365	9,501·9	648·56
Llanvabon Dainty ..	L. W. and J. T. Prosser, Leeston	3 42	281·2	365	11,669·2	644·93
Lady Celia	E. Joyce, Kaponga ..	3 218	298·8	365	10,374·0	612·95
One I Love ..	G. E. Cowling, Manaia ..	3 347	311·7	365	10,546·6	602·46
Prim's Duchess ..	J. McIvor, Ohaupo ..	3 39	280·9	365	9,206·8	563·35
Brooklyn's Cream Lady	H. J. Lancaster, Glen Oroua	3 258	302·8	365	10,865·7	560·23
Marshland's Good Luck	W. J. Chynoweth, Hamilton	3 360	313·0	365	8,747·9	537·28

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
Three-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Royton Vera ..	H. Moreland, Newstead ..	3 295	306·5	365	9,657·2	523·61
Lady Love's Farewell	L. W. and J. T. Prosser, Leeston	3 62	283·2	365	8,375·1	520·71
Dainty Bairn ..	K. Rothe, Riverlea ..	3 260	303·0	358	8,570·6	460·67
Oenothera	R. J. Wilson, Putaruru ..	3 344	311·4	304	9,299·6	425·92
Centuriana.. ..	J. Nicholson, Manakau ..	3 226	299·6	343	7,459·7	418·87
Neat Pride's Orphan	D. L. A. Astbury, Mangatoki	3 24	279·4	365	7,415·1	417·70
Clematis of the Meadows	R. Cobbe, Aorangi ..	3 363	313·3	365	6,815·4	400·04
Franella . ..	G. A. Berry, Manaia ..	3 336	310·6	365	6,814·4	397·50
Four-year-old.						
Lady Knight* ..	F. J. Finer, Ngutuwera ..	4 75	321·0	365	10,670·2	675·35
Erinview Maid† ..	J. Murray, Woodville ..	4 12	314·7	365	11,812·7	661·81
Volpes' Streamlet† ..	H. R. Benbow, Ormondville	4 20	315·5	328	10,292·1	621·03
Orange Dale's Larkspur	W. J. Hall, Matatoki ..	4 34	316·9	365	9,984·4	615·17
V.A.D.	A. R. Clark, Hamilton ..	4 22	315·7	365	10,497·2	608·96
Viola's Golden Fern ..	R. Cobbe, Aorangi ..	4 22	315·7	365	10,336·2	602·17
Oaklands Guernsey ..	F. W. Cornwall, Bell Block	4 72	320·7	303	9,551·7	595·55
Fox's Snow ..	H. J. Burrell, Bunnythorpe	4 81	321·6	365	9,107·0	560·01
Twist	J. S. T. Short, Hawera ..	4 324	345·9	365	10,240·3	494·96
Sweetest Joy ..	M. A. Rogers, Katikati ..	4 226	336·1	365	8,462·7	489·44
Flower's Pearl ..	H. Moreland, Newstead ..	4 304	343·9	365	7,858·4	434·15
Heartsease	J. S. T. Short, Hawera ..	4 346	348·1	350	7,571·9	408·40
Lady Kaepe ..	G. A. Berry, Manaia ..	4 256	339·1	365	7,466·4	378·87
Mature.						
Mountain View's Pansy	J. Murray, Woodville ..	10 29	350·0	365	12,456·9	687·56
Maori Countess ..	H. B. Lepper, Lepperton ..	7 346	350·0	365	12,773·3	675·68
Waipiko Prudence ..	C. G. C. Dermer, Cheltenham	7 2	350·0	365	13,047·3	664·93
Reid Park's Queen ..	G. Bright, Otaua	8 54	350·0	365	10,870·9	661·38
Vileta	J. S. T. Short, Hawera ..	5 283	350·0	365	11,409·3	642·50
Bright Eyes Favourite	L. W. and J. T. Prosser, Leeston	5 85	350·0	365	11,542·3	639·56
Sappho's Model ..	S. Dale, Fairlie	5 296	350·0	365	10,963·1	611·39
Norah of Konini ..	T. H. Verry, Pahiatua ..	6 316	350·0	365	10,357·9	607·02
Golden Evening ..	K. M. Stevens, Maungatapere	8 55	350·0	365	10,411·4	598·30
Waipiko Leno ..	C. G. C. Dermer, Cheltenham	5 51	350·0	342	10,664·0	592·38
Gold Ring	H. R. Benbow, Ormondville	8 273	350·0	365	11,091·1	592·25
Fern Grove Louise ..	H. J. Burrell, Bunnythorpe	7 39	350·0	349	10,798·0	582·93
Bronze	D. L. A. Astbury, Mangatoki	7 340	350·0	365	9,802·3	539·11
Grannie's Beauty ..	A. J. Smith, Cardiff ..	5 68	350·0	364	10,376·3	536·11
Wai Whenua Duchess	R. J. Wilson, Putaruru ..	8 337	350·0	346	9,190·1	520·51
Waipiko Billet Doux	W. J. Chynoweth, Hamilton	6 17	350·0	365	9,982·7	507·12
Illusion	D. P. F. Maole, Kaponga ..	5 343	350·0	343	10,351·2	505·60
Starlight's Mary Chase	W. J. Hall, Matatoki ..	9 300	350·0	365	8,525·0	504·97
Lady Adelaide ..	H. Moreland, Newstead ..	10 326	350·0	365	9,670·7	502·31
Dairy Lass's Queen ..	H. J. Lancaster, Glen Oroua	8 53	350·0	339	7,684·6	502·00
Flower's Joy ..	D. L. A. Astbury, Mangatoki	6 312	350·0	365	9,994·3	496·54
Reid Park's Snuff Box	A. H. Ellicott, Hamilton ..	6 362	350·0	365	10,695·0	487·29
Bilberry's Lass ..	R. J. Wilson, Putaruru ..	5 279	350·0	340	8,428·4	476·80
Primrose Chase ..	W. J. Hall, Matatoki ..	7 304	350·0	365	8,211·9	463·61
Hope's Girl ..	A. H. Ellicott, Hamilton ..	6 61	350·0	365	8,910·1	460·09
Wai Whenua Flower	R. J. Wilson, Putaruru ..	7 309	350·0	365	8,342·8	457·21
Kitty Mahone ..	K. M. Stevens, Maungatapere	8 298	350·0	365	8,631·7	456·31
Golden Sunray ..	A. Mouldey, Tirau ..	9 326	350·0	353	7,812·9	433·67

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
Mature—continued.		yrs. dys.	lb.		lb.	lb.
Ariadne's Belle ..	H. O. Washbourn, Richmond	7 27	350·0	365	7,925·3	410·81
Golden Grape ..	K. M. Stevens, Maungatapere	7 58	350·0	346	7,730·5	377·54
	FRIESIANS.					
Junior Two-year-old.						
Coldstream Favourite*	V. Marx, Mangatoki ..	1 357	240·5	365	15,256·8	547·27
Brookside Domino Maid†	Cameron Bros., Stratford ..	1 347	240·5	365	13,267·7	477·18
Coldstream Pontiac Princess 2nd*	Marchant and Sons, Cardiff	1 355	240·5	348	10,849·1	453·60
Dominion Azalia 2nd	Central Development Farm, Weraroa	2 30	244·1	365	14,846·4	452·93
Dominion Olga of Rock	Central Development Farm, Weraroa	1 348	240·5	365	10,748·9	440·19
Ellerlea Ena Minto de Kol*	A. C. M. Finlayson, Kamo ..	2 10	241·5	365	11,496·1	427·84
Hanley Transvaal Darkie†	G. H. Hassall, Clarkville ..	2 30	243·5	365	11,055·5	425·39
Dominion Frisby Beets	Central Development Farm, Weraroa	1 362	240·5	365	14,247·1	406·10
Rosevale Inka Lassie*	McDonald and Co., Dunedin	2 25	243·0	365	11,295·7	356·36
Dominion Princess Inka Pietertje	Central Development Farm, Weraroa	1 290	240·5	349	11,096·9	347·29
Dominion Woodcrest Manola	Central Development Farm, Weraroa	1 344	240·5	337	10,721·0	344·46
Rosevale Pet Plus Triumph*	McDonald and Co., Dunedin	1 320	240·5	365	9,984·7	341·30
Longbeach Buttercup 6th*	J. H. Grigg, Longbeach ..	2 81	248·6	365	9,506·7	334·46
Dominion Miss Tromp	Central Development Farm, Weraroa	1 325	240·5	365	10,383·7	333·69
Ellerlea Rag Apple Minto de Kol*	A. C. M. Finlayson, Kamo ..	2 38	244·3	363	9,563·9	325·78
Everslea Lotje Girl† ..	Muff Bros., Orari	1 356	240·5	365	9,107·4	320·44
Dominion Queen Segis of Rock	Central Development Farm, Weraroa	1 349	240·5	355	9,831·7	312·33
Everslea Medbury Lucy*	Muff Bros., Orari	1 244	240·5	365	9,341·9	309·03
Ellerlea Biddy Minto de Kol*	A. C. M. Finlayson, Kamo	2 27	243·2	365	8,139·6	289·49
Senior Two-year-old.						
Bainfield Woodcrest Sylvia Pauline*	F. Smedley, Te Awamutu ..	2 273	267·8	365	20,564·6	681·91
Hanley Betty† ..	G. H. Hassall, Clarkville ..	2 310	271·5	339	11,751·0	421·81
Junior Three-year-old.						
Tunanui Ashlynn Rosebud†	A. H. Russell, Hastings ..	3 171	294·1	365	17,675·3	629·07
Springtime of Oakview 3rd*	H. R. Green, Kairanga ..	3 69	283·9	326	15,129·9	546·35
Ryvington Rosette† ..	Hodgson Estate, Tamahere	3 8	277·8	337	14,500·6	470·93
Bainfield Topsy 10th*	W. D. Hunt, Invercargill ..	3 88	285·8	221	11,536·8	468·41
Carlyle Anenome† ..	Piri Land Company, Orini ..	3 51	282·1	365	11,609·9	462·25
Dominion Mierlo Mercedes	Central Development Farm, Weraroa	3 7	277·7	326	10,877·3	301·84

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
FRIESIANS *continued.*						
Junior Four-year-old.		Yrs. dys.	lb.		lb.	lb.
Galatea Segis of Ngatoro†	Piri Land Company, Orini ..	4 92	322·7	365	17,184·9	599·44
Fairmont Pietertje Lady*	J. Hart, Tatuanui ..	4 27	316·2	274	13,401·8	532·86
Senior Four-year-old.						
Dominion Jessie Fobes	Central Development Farm, Weraroa	4 308	344·3	265	12,746·1	406·15
Mature.						
Alcartra Rozine de Kol†	A. W. Chapman, Gordonton	10 11	350·0	365	22,986·9	792·81
Forest Johanna† ..	Cameron Bros., Stratford ..	6 325	350·0	365	18,068·7	690·44
Weston Lea Fancy de Kol*	E. F. Peacocke, Hamilton ..	6 100	350·0	365	16,417·9	629·25
Riverdale Blackberry*	E. F. Peacocke, Hamilton ..	8 311	350·0	365	18,947·6	618·08
Coldstream Princess Inka Pieterje*	Marchant and Sons, Cardiff	5 49	350·0	282	17,174·5	601·86
Clothilde Alcartra Fayne†	A. W. Chapman, Gordonton	8 60	350·0	321	18,734·0	600·73
Cluny Hengerveld Rosebud 2nd†	A. H. Russell, Hastings ..	8 86	350·0	365	17,044·0	591·40
Weston Lea Snowdrift de Kol*	E. F. Peacocke, Hamilton ..	6 87	350·0	365	17,315·3	585·17
Woodcrest Gem† ..	A. H. Russell, Hastings ..	8 73	350·0	330	11,938·0	379·91
MILKING SHORTHORNS.						
Senior Two-year-old.						
Brookside Peggy ..	J. Pease, Matatoki ..	2 361	276·6	365	6,735·25	293·76
Senior Three-year-old.						
Vale Royal Doffie ..	W. Bowis, Doyleston ..	3 361	313·1	352	10,900·5	386·28
Junior Four-year-old.						
Brookside Beauty ..	J. Pease, Matatoki ..	4 32	316·7	365	11,336·75	454·64
Senior Four-year-old.						
Matangi Violet 2nd† ..	Ranstead Bros., Matangi ..	4 303	343·8	365	14,383·7	621·54
Matangi Clara 2nd† ..	Ranstead Bros., Matangi ..	4 325	346·0	325	11,689·6	455·77
AYRSHIRES.						
Three-year-old.						
Ivanhoe Stylish Daisy*	A. M. Weir, Menzies Ferry	3 312	308·2	365	12,334·2	574·09
Ivanhoe Nora* ..	A. M. Weir, Menzies Ferry	3 282	305·2	358	10,999·7	454·53
Four-year-old.						
Birchwood Favourite 1st*	T. G. Dobbie, Menzies Ferry	4 1	313·6	365	13,400·9	566·27
White Heather of Ashleigh Park†	C. B. Morgan, Ngawapurua	4 2	313·7	365	11,594·8	465·61
Mature.						
Ivanhoe Rubina* ..	A. M. Weir, Menzies Ferry	6 337	350·0	365	12,600·6	497·35
Ivanhoe Blanche* ..	A. M. Weir, Menzies Ferry	..	350·0	365	12,906·7	459·39
Chloe of Waiuku ..	N. Brown, Buckland ..	9 49	350·0	339	9,633·0	385·55

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		RED POLLS.				
		Yrs. dys.	lb.		lb.	lb.
Two-year-old.						
Dominion Sylphide ..	Central Development Farm, Weraroa	1 339	240·5	341	8,651·1	430·74
Dominion Birdseye ..	Central Development Farm, Weraroa	1 292	240·5	338	6,704·7	332·59
Three-year-old.						
Dominion Rhodesia ..	Central Development Farm, Weraroa	3 23	279·3	333	7,096·2	327·55
Four-year-old.						
Dominion Ruapehu ..	Central Development Farm, Weraroa	4 24	315·9	333	7,735·1	335·02
Mature.						
Dominion Riverina ..	Central Development Farm, Weraroa	5 241	350·0	296	8,012·7	379·52

Second-class Certificates.

		JERSEYS.				
Senior Two-year-old.						
Ku Ku Pearl ..	R. L. Horn, sen., Ohau ..	2 280	268·5	365	12,591·5	565·91
Palmdale Golden Dawn	D. Kennedy, Morven ..	2 359	276·4	365	9,775·0	559·05
Marshlands Tango ..	W. J. Chynoweth, Hamilton	2 363	276·8	365	7,723·6	477·47
Mauriaena Fairy ..	Aickin and McCarroll, Woodhill	2 265	267·0	365	7,072·1	417·25
Three-year-old.						
Folly's Pet.. ..	G. A. Gamn an, Marton ..	3 273	304·3	365	9,419·7	532·20
Awatane Dorcas ..	J. Nicholson, Manakau ..	3 123	289·3	365	11,056·1	487·23
Four-year-old.						
Golden Vein ..	G. E. Cowling, Manaia ..	4 309	344·4	365	11,921·3	692·29
Mature.						
Della	J. Nicholson, Manakau ..	7 294	350·0	365	9,336·1	546·66
		FRIESIANS.				
Mature.						
Colantha Know-not*	R. C. Allen, Annandale ..	8 263	350·0	365	22,921·9	705·50
Friesland Park Alba Colantha*	Muff Bros., Orari.. ..	9 233	350·0	365	16,191·5	541·46

Noxious Weeds Orders.—Gorse has been declared to be a noxious weed within the Borough of Opotiki. The Borough of Balclutha has declared Californian thistle and ragwort *not* to be noxious weeds within its boundaries.

Green and Root Crops and Hay.—The area of grasses and clovers (including lucerne) cut for hay in 1923–24 increased by 13,421 acres compared with 1922–23; potatoes and mangolds increased by 896 and 295 acres respectively. Green-fodder crops decreased by 9,765 acres, turnips by 15,593 acres, and onions by 163 acres.

The Waiapu Pastoral and Industrial Association has been incorporated under the Agricultural and Pastoral Societies Act.

CONTROL OF ORCHARD AND GARDEN PESTS AND DISEASES.

Horticulture Division.

It is important to distinguish between the different pests and diseases that attack fruit-trees, otherwise a great deal of time and material will be wasted in useless attempts to control them by the application of wrong spraying-mixtures. If the nature of the disease is known the remedy is more easily determined. It may therefore be of value to here place the principal diseases in their respective classes, and likewise the spraying-materials most generally in use in a corresponding class. These can be used for reference when considering the methods of control.

Pests.	*Controls.*
Chewing-insects	Poison sprays.
Sucking-insects	Contact sprays (insecticides).
Diseases.	
Fungoid diseases	Fungicides.

CHEWING-INSECTS.

Chewing-insects comprise those that chew and eat their food, whether it be leaf or fruit. The following are the most common and destructive: Codlin-moth, leaf-roller caterpillar, pear-slug, bronze-beetle, raspberry-bud weevil, tomato-caterpillar.

POISON SPRAYS.

Arsenate of lead is now almost universally used, and answers practically all purposes. Use 1½ lb. of arsenate-of-lead paste or ¾ lb. of powder to 50 gallons of water (2 oz. paste or 1 oz. powder to 4 gallons water). In the case of pip-fruits commence spraying as soon as the majority of the petals have fallen, and repeat the application at intervals of fourteen to twenty-one days throughout the season, the main object being to keep the fruit and foliage thoroughly covered with the spray. Applications to late varieties of apples are often discontinued too soon, and the crop is packed while infected with leaf-roller caterpillar, with great resultant loss.

SUCKING-INSECTS.

Sucking-insects comprise those that feed upon the juices of the fruit, stem, and foliage by means of a proboscis which penetrates the surface and sucks up the natural juices of the plant. The following are the principal orchard insects in this class: Mussel, San José and other scale insects, mealy bug, woolly aphis and other aphides, red mite, pear-mite, thrips, and leaf-hoppers.

INSECTICIDES (CONTACT SPRAYS).

Red-oil emulsion has proved most effectual for these pests on fruit-trees. There are numerous brands of commercially-prepared oils on

the market, needing only the addition of soft water to make them ready for use. They are quite easy to mix if the following instructions are carried out: Take one part of red oil and place it in a bucket (a benzine-tin answers admirably). Next take one part water and pour this into the vessel containing the oil. Stir or agitate the mixture, and an emulsion is readily formed. It is then ready for further dilution as may be required. Should the water be very hard a little soda should be dissolved in it before mixing.

The following strengths are recommended, but may vary slightly according to the locality and time of application:—

Pip-fruits.—1 gallon red oil to 10–15 gallons water, applied towards the end of August or the beginning of September. Trees badly affected with woolly aphis may be sprayed with red oil, 1–60, as soon as the fruit is gathered.

Stone-fruits.—1 gallon oil to 12 or 15 gallons water, in early spring, but when the trees are dormant. Trees affected with San José scale in autumn should be cleaned up with lime-sulphur sprays before they become dormant.

Citrus-fruits.—1 gallon oil to 40 gallons water. Apply in spring, after an inch or so of growth has been made; also in autumn, towards the end of March, when the summer crop has been gathered.

Nicotine Concentrate (Black Leaf 40).—This is a safe and efficient insecticide for use during the growing-period. Use one part of Black Leaf 40 to 1,200 parts of water, first adding 3 lb. or 4 lb. of dissolved soap to the 100 gallons water. The soap is an important ingredient, but when using Black Leaf 40 in combination with other sprays the soap should be omitted.

Lime-sulphur Concentrate.—This mixture has some insecticidal qualities; they are chiefly useful in the control of red mite and San José scale. For details of strength of mixture see "Fungicides."

FUNGOID DISEASES.

Following are some of the principal fungoid diseases: Black-spot on apple and pear, leaf-curl on peaches and nectarines, bladder or pocket plums on plums, powdery mildew on apples, shot-hole fungus on apricots, brown-rot of stone-fruits, and verrucosis of citrus-fruits.

FUNGICIDES.

There are three in general use:—

(1.) *Bordeaux Mixture.*—In this the active agent is bluestone (sulphate of copper) temporarily neutralized by combination with quicklime, both being dissolved in water. In recipes the ingredients are quoted in this order. The right method of mixing these ingredients is most important and should be carefully followed. To make bordeaux, 8-6-50, dissolve 8 lb. bluestone in 25 gallons water. This may be done by placing the bluestone in sacking and suspending it in the water. Take 6 lb. of good quicklime and slake it in another barrel, using a small quantity of water; then dilute it up to 25 gallons. Pour the two solutions simultaneously into the spray-tank, and the mixture will

be ready for use. The best results are obtained when the application is made as soon as possible after blending the two solutions. If allowed to stand over eight hours the fungicidal properties largely depreciate. Stock solutions of the ingredients may be kept satisfactorily, but, as just stated, they should not be mixed until required. Bordeaux should be neutral or slightly alkaline; it should never contain an excess of copper sulphate. It should give no reaction to litmus paper. A bright steel knife-blade dipped in the acid mixture is quickly covered with a deposit of metallic copper. Again, free copper is quickly detected if a little of the mixture is placed in a saucer and a drop of solution of ferro-cyanide of potassium is poured on it, when it will immediately assume a muddy brown appearance. This precaution is important when spraying during the growing-period.

(2.) *Lime-sulphur.*—This is sulphur made into a liquid form by boiling it in lime-water. Large users generally make their own. It may be made as follows: Sulphur, 100 lb.; rock lime (95 per cent. pure), 50 lb.; water, 50 gallons. Slake the lime carefully and strain it into an iron boiler. Mix the sulphur to a paste and add it to the lime-water, also sufficient water to make it up to 50 gallons. Boil the mixture until all the sulphur is dissolved (about an hour), taking care to replace the water evaporated. Solutions made in this way usually register 20° to 25° Beaume. To make correct dilutions the specific gravity of the concentrate should be ascertained by means of the Beaume hydrometer, and reference made to the dilution table on page 48.

(3.) *Finely Precipitated Sulphur (In Paste Form).*—The commercial proprietary preparations of this material are generally used.

CONTROL TREATMENTS.

Apple, for Black-spot and Powdery Mildew.—In spring, as the buds are breaking (green-tip), apply lime-sulphur (33° Beaume test), 1–10. As the flower-buds break (pink), make another application, 1–35 or 1–50. When the petals fall give the calyx spray, 1–80 or 1–100. Follow at intervals thereafter, as required, at 1–125. In some localities it has been found necessary to use the stronger fungicide bordeaux, 6–4–50, at the green-tip, and 3–4–50 at the pink stage, subsequent sprays being lime-sulphur, 1–100 or 1–125. On some varieties the use of bordeaux has a tendency to cause russeting of the skin of the fruit. Some varieties that are specially tender, and trees in weak condition, are sometimes sprayed at the calyx stage and after with finely precipitated sulphur, 1 lb. to 8 or 10 gallons of water. (See illustration of various stages of blossom-development.)

Pear, for Black-spot.—Apply bordeaux, 6–4–50, at green-tip, 4–4–50 at the pink, and 3–4–50 at the calyx stage; and at intervals thereafter as required.

Stone-fruits, for Leaf-curl, Shot-hole, Bladder-plum, and Brown-rot.—Apply bordeaux, 8–6–50, as the buds commence to move, and 6–4–50 at the pink stage. Where brown-rot is prevalent trees should be sprayed with lime-sulphur, 1–125, when the fruit has set, and at intervals of about twenty-one days thereafter till within a week or so of picking. It is also necessary to go over the trees carefully every week during the fruiting season and gather and destroy affected fruit.

STAGES OF APPLE-BLOSSOM DEVELOPMENT.

(1) Green-tip; (2) tight-cluster; (3) open-cluster; (4) pink; (5) full-bloom; (6) petal-fall; (7) calyx-closed.

[Drawing by N. J. Adamson.

REFERENCE TABLE FOR STANDARDIZING HOME-MADE LIME-SULPHUR SOLUTION BASED ON A 33° BEAUME STANDARD.

Beaume.	1–10.	1–15.	1–20.	1–25.	1–30.	1–40.	1–50.	1–60.	1–70.	1–80.	1–90.	1–100.	1–110.	1–120.	1–125.
15° ..	4·6	6·8	9·1	11·4	13·6	18·2	22·8	27·3	31·8	36·4	40·9	45·5	50·0	54·5	56·8
16° ..	4·8	7·3	9·7	12·1	14·5	19·4	24·3	29·1	33·9	38·8	43·6	48·5	53·3	58·2	60·6
17° ..	5·2	7·7	10·3	12·9	15·5	20·6	25·8	30·9	36·1	41·2	46·4	51·5	56·7	61·8	64·4
18° ..	5·5	8·2	10·9	13·6	16·4	21·8	27·3	32·7	38·2	43·6	49·1	54·5	60·0	65·5	68·2
19° ..	5·8	8·6	11·5	14·4	17·3	23·0	28·8	34·5	40·3	46·1	51·8	57·6	63·3	69·1	72·0
20° ..	6·1	9·1	12·1	15·2	18·2	24·2	30·3	36·4	42·4	48·5	54·6	60·6	66·7	72·7	75·8
21° ..	6·4	9·5	12·7	15·9	19·1	25·5	31·8	38·2	44·5	50·9	57·3	63·6	70·0	76·4	79·5
22° ..	6·7	10·0	13·3	16·7	20·0	26·7	33·3	40·0	46·7	53·3	60·0	66·7	73·3	80·0	83·3
23° ..	7·0	10·5	13·9	17·4	20·9	27·9	34·8	41·8	48·8	55·8	62·7	69·7	76·7	83·6	87·1
24° ..	7·3	10·9	14·5	18·2	21·8	29·1	36·4	43·6	50·9	58·2	65·5	72·7	80·0	87·3	90·9
25° ..	7·6	11·4	15·2	19·0	22·7	30·3	37·9	45·5	53·0	60·6	68·2	75·8	83·3	90·9	94·7
26° ..	7·9	11·8	15·8	19·7	23·6	31·5	39·4	47·3	55·2	63·0	70·9	78·8	86·7	94·5	98·5
27° ..	8·2	12·3	16·4	20·5	24·5	32·7	40·9	49·1	57·3	65·5	73·6	81·8	90·0	98·2	102·3
28° ..	8·5	12·7	17·0	21·2	25·5	33·9	42·4	50·9	59·4	67·9	76·4	84·8	93·3	101·8	106·1
29° ..	8·8	13·2	17·6	22·0	26·4	35·2	43·9	52·7	61·5	70·3	79·1	87·9	96·7	105·5	109·8
30° ..	9·1	13·6	18·2	22·7	27·3	36·4	45·5	54·5	63·6	72·7	81·8	90·9	100·0	109·1	113·6
31° ..	9·4	14·1	18·8	23·5	28·2	37·6	47·0	56·4	65·8	75·2	84·5	93·9	103·3	112·7	117·4
32° ..	9·7	14·5	19·4	24·2	29·1	38·8	48·5	58·2	67·9	77·6	87·3	97·0	106·7	116·4	121·2
33° ..	10·0	15·0	20·0	25·0	30·0	40·0	50·0	60·0	70·0	80·0	90·0	100·0	110·0	120·0	125·0
34° ..	10·3	15·4	20·6	25·8	30·9	41·2	51·5	61·8	72·1	82·4	92·7	103·0	113·3	123·6	128·8
35° ..	10·6	15·9	21·2	26·5	31·8	42·4	53·0	63·6	74·2	84·8	95·5	106·1	116·7	127·3	132·6

The specific gravity of home-made lime-sulphur is invariably lower than that of the commercial solution. It is therefore advisable when using the former to first ascertain the Beaume specific gravity of the mixture, and to dilute it according to the above table. (To prepare a spray of any standard strength, first find the specific gravity of the solution by means of a Beaume hydrometer. Mark the figures in the column on the left of the chart corresponding with the reading of the hydrometer. Next select the figures in the top line representing the strength of the spray required. The figures where this column and the cross-line denoting the specific gravity of the solution intersect represent the quantity of water required to make a spray mixture of equal strength to that given at the top of the column. The table does not apply to self-boiled lime-sulphur.)

Bluestone solution—1 lb. bluestone to 15 or 20 gallons water—may be applied when the trees are dormant, in place of the first above-mentioned bordeaux spray.

Citrus-fruits, for Verrucosis, Grey-scab, &c.—Apply bordeaux, 4–4–40, or lime-sulphur, 1–50, in spring, when the main crop has set, and again in the autumn.

COMBINED SPRAYS.

Some sprays may be combined with others without detriment, and labour thus saved. Bordeaux and arsenate of lead may be applied together; also lime-sulphur and arsenate of lead; and lime-sulphur, arsenate of lead, and Black Leaf 40. It is advisable to make a heavy dilution of these ingredients before mixing them. In combining lime-sulphur with arsenate of lead, when the trees are tender it is advisable when diluting the arsenate of lead to include the milk of an equal weight of lime.

SPREADERS.

The use of spreaders in conjunction with the different sprays is a practice that is growing in popularity. It is claimed that this practice ensures instant and prolonged adhesion, an even distribution, and a better suspension of the ingredients, and that sprays which lack these qualities are greatly benefited by the inclusion of such a substance. There are several proprietary spreaders on the market, but powdered casein is claimed to serve the purpose quite satisfactorily. It may be prepared as follows: Place 5 oz. casein in a vessel and slowly add ½ gallon water, stirring well. Slowly slake 5 oz. lime and make up to ½ gallon. Pour the lime-water slowly into the casein, stirring well. Put the requisite quantity of water into the spray-tank, add the casein mixture, agitate thoroughly, then add the other ingredients. This is sufficient for 100 gallons of spray mixture.

GENERAL.

It should be recognized that owing to differences in climatic conditions and other varying factors only generalities can be dealt with in an article such as this. For this reason orchardists desirous of obtaining the best results by the most economical methods should consult the Orchard Instructor in their respective districts, the Instructor being in a position to give more specialized advice.

NOTE.—The foregoing matter has been issued as Bulletin No. 117, superseding Bulletin No. 82, "Orchard Pests and Diseases: Directions for Control."—EDITOR.

Honey-export Control Act.—The poll of honey-producers taken in December resulted in the proposal that the Act be brought into operation being carried by 253 votes to 9.

New Rabbit Districts.—The constituting of the Hunterville and Oroua Rabbit Districts (Wellington) and the Waipipi Rabbit District (Auckland), for the purposes of Part III of the Rabbit Nuisance Act, was gazetted last month.

Quarantine on Dogs.—The period of quarantine on dogs imported into New Zealand from Britain has been reduced from six months to sixty days. The amending regulation came into force on 11th December, 1924.

SEASONAL NOTES.

THE FARM.

VACANT LAND AND CATCH-CROPS.

An all-too-common feature of many farms in the latter part of the season is the large area of stubble and other land that has grown a crop — such as early turnips, tares, &c. — and which is left idle to grow weeds and accumulate rubbish for several months, or at least till autumn grass-sowing. This is sheer waste, for February, March, and April are all good growing months in which much may be achieved. Unless the land is excessively foul — in which case a fallow is indicated — the best plan is to run the cultivator or disks through the ground once or twice to germinate weeds. In the case of twitchy land the disks should not be used, but the twitch should be worked to the surface with the cultivator and harrows. After an interval of a couple of weeks the land may be ploughed and sown as soon as the weather conditions permit.

The utilization of such vacant land depends upon the district, the requirements of the farm, and the length of time available. When grass is to be sown in March, white mustard makes cheap and easily-grown material for ploughing in; 15 lb. of seed and 2 cwt. of super should give a good crop. It is as well to remember that though mustard rots down quickly the land should be given a week or two's fallow before the grass is sown. If autumn feed is the main consideration there is still time to sow turnips — Imperial Green Globe, Hardy Green Globe, and Green-top Scotch (Aberdeen) being all suitable generally. In some northern districts swedes have been sown as late as March with success, but swedes are less adaptable than soft turnips, and less satisfactory for late sowing. Black skinless barley is another quick-growing catch-crop that will give good grazing for cows or sheep in eight weeks from sowing. In districts free from early frosts Japanese millet may be sown up to the end of January for March feeding, but not later, as it does not thrive in the shorter days and cooler nights of autumn. For later sowing and later use Algerian oats and rye-corn are both good winter grazing crops, while Western Wolths or Italian rye-grass can be sown in February for autumn or spring feed. A good mixture for average-quality land for grazing in May, and again in August and September, is—Western Wolths, 15 lb.; Italian rye-grass, 15 lb.; crimson clover, 5 lb.; red clover, 3 lb.; with super (or super and blood-and-bone), 3 cwt. This mixture is purely temporary, but will yield double the feed of permanent pasture, and that at difficult seasons of the year. For South Otago and Southland a mixture of Scotch vetches or golden tares with oats, at the rate of 1 bushel of the former and 2 bushels of the latter, is recommended for early spring feed. In Central Otago rye-corn sown at the rate of 2½ bushels will prove very useful for either lambing ewes or early calvers.

PREPARATION FOR GRASS-SOWING.

Many farmers will now be thinking of grass-sowing. In making up mixtures local conditions of soil and climate must be taken into consideration; a mixture suitable to one district often does not give satisfactory results in another. In the preparation of land (where ploughable) an early start is invaluable, as it enables the killing of weeds that would otherwise harass and weaken the young grass. Consolidation of the seed-bed is highly important; clover in particular does not strike well on loose ground. When a crop has been fed off with sheep and the land is clean it is often better to disk rather than plough, so that the treading and the manure may not be lost.

LUCERNE.

Provided the weather is seasonable, February is generally a favourable period for sowing lucerne. Compared with spring sowing, more time is available for destroying weeds, and there is less likelihood of a cold wet spell of weather following closely on the germination of the lucerne-seed and so checking the growth of the young plants. A frequent mistake in lucerne-culture is that of sowing too deeply. Sometimes one sees the ordinary tine harrows being used for this purpose, with the result that a large proportion of the seed is buried. A light brush harrow, or one made from strips of wire netting laced together and weighted at the end with bolts, will be found more satisfactory for covering the seed.

The coming month is also a good time for destroying weeds and grass which may be infesting stands of lucerne. As the lucerne is cut the land should be cultivated. If clean, a stroke of the tine harrows to keep the soil free is all that is required; but if dirty, stronger methods must be adopted. Young lucerne crops sown in November and December should be ready for cutting about the end of February, and will greatly benefit by a cultivation to keep the land free and destroy weeds. Under normal Canterbury conditions it is generally found economical to graze the last growth of established stands of lucerne. The cut is usually so light that it does not pay for working-expenses for haying. As soon as growth ceases, the land should be stirred with the grubber.

ROOT CROPS.

The intercultivation of root crops should be continued as long as possible. This operation not only keeps down weeds, but conserves moisture and aerates the soil, greatly promoting growth of the crop. Thinning of the later-sown turnip and swede crops will also call for attention at this time.

POTATOES.

In the coming month the later potato crops will be given their last cultivation. Potatoes being essentially a cleaning crop, it pays to keep the cultivator going as long as possible. Preparations may be made for saving seed. Only those tubers free from disease should be selected, and although the storage of immature seed is not always easily accomplished the latter usually gives the best results. Medium-sized seed about the size of a hen's egg will be found the most suitable generally.

—*Fields Division.*

THE ORCHARD.

EXPORT POINTS.

WHERE export is contemplated growers will do well to review the results obtained during the last season. No doubt there are many lessons to learn both in regard to the best time to gather the fruit and also in regard to the handling afterwards. Reports indicate that there is at least some room for improvement in both directions. The season will no doubt govern the picking-period. It is generally recognized that if the autumn is a dry one fruit may be left to reach a greater stage of maturity than if weather conditions are wet. This, I think, was demonstrated last season not only in regard to that portion of the fruit crop which was exported, but also to that portion of it which was placed on the local markets. Grading has also been much commented upon, and some have found that fruit is much more subject to bruising where machines are used. Although hand grading may be a little more costly, this may easily be more than compensated for by the extra price realized. How to pack fruit so that it will arrive at its destination with a minimum of bruising is no doubt a problem confronting many at this time. A little extra care and time spent when packing are well worth while. A high bulge in order to allow for subsequent shrinking is undesirable with the present New Zealand case, and from experience gained while going round the local markets this method cannot be recommended. However, a slight bulge is necessary, and is quite a good practice.

BUDDING.

This can be carried out during the next two months. The operation is a comparatively easy one, and can be successfully carried out by almost any one. The most successful and generally practised system is that known as "shield" budding. A small cross-cut is made, and the bark is raised the full length of the slit or cut to enable the bud to slip down into position easily. In preparing a bud a piece of the growing wood of the current season's growth with a well-formed bud is selected; a sharp knife is then passed from, say, ½ in. below the bud to the same distance above, taking about one-third of the wood of the shoot with the bud. If the wood is in a proper condition to bud, the wood cut with the bud can be easily pulled away from it by gently taking the bark with one hand and the wood with the other. If the interior of the bud is torn out in the process it is useless and a fresh bud must be used. No time should be lost in inserting the bud into the incision prepared for its reception, and it should then be tied round with raffia.

SPRAYING.

A lookout should still be kept for any diseases, so that a spraying as recommended previously may be carried out as required. A careful watch should be kept for leaf-roller caterpillars. The greatest damage is often done by this insect during the autumn months, and although the grub does not eat into the fruit in the same way as the codlin-moth it eats the skin and thereby causes much loss to growers. Where apples are in clusters or covered at all with leaves care should

be taken to force the arsenate-of-lead spray well into these. It is in such conditions that the chief damage is done by the caterpillar.

COVER-CROPS.

Should cover-crops be contemplated, the month of February is usually the best time in which to sow. If, as previously recommended, cultivation has been carried out very little preparation of the soil will be necessary. Peas, lupins, and vetches are among the best crops. However, if the seed of these cannot readily be obtained, mustard, oats, or barley may be sown. Where organic matter is lacking in the soil, green-manuring should not be neglected. It is recognized that this is one of the simplest and easiest ways of adding to the soil one of the chief constituents necessary for the growing of good healthy trees, also for the production of high-class fruit, and without which no orchard can be made really profitable over a long period of years.

—L. Paynter, Orchard Instructor, Christchurch.

CITRUS-CULTURE.

The chief work for the coming month will be the carrying out of necessary cultivation and the putting on of spray compounds where necessary, according to the directions given in the December *Journal*. It is noticed that the attacks from thrip are rather greater this year than usual, and trees should be treated as already advised.

FIREBLIGHT.

It is gratifying to note that up to the time of writing no infection from fireblight has been in evidence in the commercial areas of the Auckland District, and it is reasonable to suppose that, except for the possibility of slight tip-infection somewhat later on, there is little likelihood of any other infection this season.

—J. W. Collard, Orchard Instructor, Auckland.

THE APIARY.

THE EXTRACTING SEASON.

By this time, provided weather conditions are favourable, extracting will be in full swing in all districts. There may be two or more extractings during the season, or the honey may be left in the hives till the close of the flow and the whole crop removed at one time. In the latter case the beekeeper needs an ample supply of supers and combs, and must watch attentively that the hives do not become honey-bound and the bees commence loafing. The better plan is to have two or three extractings during the season, removing at the first operation all combs in which the honey is wholly or three-parts sealed. When these are emptied and returned to the hives the excluders should be brought into use if they are not already in the hives.

Hot sunny weather should be chosen for the work, as on such days the honey runs freely and the bees are good-tempered. A good plan is to remove the honey in the morning, stacking the supers in

the honey-house as they are removed, preparatory to extracting in the afternoon. By this method all stray bees can be removed before the actual extracting commences, and the operator can work quickly and peacefully at emptying the combs till the evening, when the empty combs can be returned to the hives. By the morning the bees will have settled down and returned to the task of refilling. "Keep the extractor running" is a good maxim once the work has commenced, and every hot day should be utilized for gathering the harvest.

REMOVING HONEY FROM THE HIVES.

Honey should not be removed from the hives until it is well ripened. When the surfaces of the combs are a half to three-parts capped the honey is usually sufficiently ripe to enable the beekeeper to extract with perfect safety. In northern districts the practice of taking off "green honey," to be afterwards ripened in the tanks, has been to some extent carried out, but the humidity of the climate must be the deciding factor. In southern districts such procedure would be dangerous, and care should be exercised and only well-ripened honey taken. By taking unripe honey, fermentation will often result, rendering it unfit for consumption. When the time for extracting is at hand the usual practice is to remove the combs one by one, and to brush or shake off the adhering bees. As the combs are relieved of the bees they should be stacked in a super, to be afterwards removed to the honey-house. It is a wise precaution at all times to place a cloth over the combs in the super, and if there are any signs of robbing it is a good plan to use a damp cloth which has been previously immersed in water containing a small percentage of carbolic acid.

STRAINERS.

Some form of strainer should be adopted to catch the larger particles of wax, dead bees, &c., in the honey as it leaves the extractor and before it finally reaches the tank. It is a simple matter to strain the honey, and yet this important part of the work receives less attention than its importance demands. It should be the aim of every beekeeper to see that his product is rendered as marketable as possible before it finally reaches the customer, and thus create a name for a high-class article. Wax is not a component part of honey, and dead bees are foreign matter, and yet they are frequently found in honey exposed for sale. Honey containing either is not likely to suit the buyer, and its selling-value is consequently reduced. To ensure that all but the smallest particles of wax will be removed the honey should be run through a fine wire strainer, and finally passed through fine cheesecloth before entering the tank. Cheesecloth strainers are cheap and are easily made, and should be cleansed after each day's operations. The strainers should be of such construction as to be easily cleaned, and if the cloth is tacked into wooden frames the operation is greatly facilitated. Use cold water when cleansing the strainers: hot water melts the particles of wax, thereby clogging the holes in the cloth; whereas cold water removes all wax from the surface. Hang the strainers up to dry, so as to be ready for use when required.

HONEY-TANK.

No part of the apiary equipment is of more importance at extracting-time than a good tank. From the strainers in use it is

advantageous to run the honey into a tank, so that the small particles of wax that pass through the strainers will rise to the surface, when they can be skimmed off before finally drawing the honey off at the bottom of the tank. Many beekeepers run their honey direct from the strainers into tins and small packages ready for sale, with the result that the small particles of wax rise to the surface, to the detriment of the honey and its sale. Frequently complaints are made as to the quality of the honey, and not infrequently adulteration is suspected through an excess of these wax-particles rising to the surface. Such honey should not find its way to market, its condition having been brought about by sheer neglect on the part of the beekeeper to provide adequate tank accommodation. By allowing the honey to settle in the tank the air-bubbles escape, the small particles of wax rise to the surface, and in dry weather surplus water is evaporated. The size of the tank to be adopted must be decided by the beekeeper himself, as it is hard to find two beekeepers with requirements alike in the matter of honey-tanks. He must study his needs and convenience, but in any case the tank should hold enough to enable him to deal with the honey in the hives at the time of extracting. The tank illustrated in Bulletin No. 55, "Bee-culture," in use at the Department's experimental apiary, is capable of dealing with the product of two hundred colonies, and is so arranged that each extracting can be left undisturbed until it is matured and ready to be run off into the tins.

CLEANLINESS IN THE HONEY-HOUSE.

It should hardly be necessary to point out that the greatest care must be taken in preparing honey for market. However, it is by no means an uncommon thing to come across cases where the beekeeper appears to have lost sight of the fact that honey is a food, and, what is of more importance, a food which is eaten uncooked. Too much stress cannot be laid on the fact that everything in the honey-house should receive the same attention as dairy utensils. The extractor and tank cannot be washed out every day during the season, but they should be thoroughly scalded before commencing operations, and whenever honey is allowed to remain in them they should be covered with clean washing covers. These cost little, are easily made, and should be very much in evidence throughout the season. On no account should bees, flies, dust, or other foreign matter be allowed to alight on the honey in the tank, and as soon as extracting is finished for the day the extractor should be closely covered with a cloth. Finally, as a fitting close to the day's work, the floor of the extracting-room should be washed and every drop of honey spilt during the day removed.

TREATMENT OF FOUL-BROOD.

The work of putting colonies under treatment where foul-brood is detected should not be postponed. The season is a short one, and every effort should be made to winter only clean hives. The risk of having the disease spread by robbing during the off-season, when it is most likely to break out, will lead to endless work in the spring unless the beekeeper is in earnest in checking its spread during favourable conditions. No better plan can be followed than to treat all infected colonies by the McEvoy method during the late

flow. Many beekeepers are too ready to postpone treatment, only to find in the spring their hives weak in bees, and consequently in poor condition for successful treatment. No half-measures should be adopted when dealing with foul-brood, and in all cases the "double shake" should be practised if the disease is to be entirely eradicated. A good plan to follow if any doubt exists as to the complete absence of the disease is to mark all infected colonies, and to leave them to be finally dealt with after the clean colonies are extracted. In any case the combs should be marked with the number of the hive to which they belong, so that when they are extracted they may be returned to the colony from which they were taken. If these precautions are taken the risk of spreading disease by means of wet combs is minimized.

—E. A. Earp, Senior Apiary Instructor.

POULTRY-KEEPING.

CARE OF THE PULLETS: PRECAUTIONS AGAINST COLDS.

Now that the great majority of the young stock will have attained an age when they do not require constant attention an opportunity is provided for getting the plant in good order for the winter season. Every care should be taken to make the houses where the young pullets are to be placed later fit to receive them, so that they will not have any setback. The houses should be thoroughly cleaned, sprayed with a good disinfectant, and otherwise made as sweet and comfortable as possible. Not only should they be free from vermin, but special attention should also be taken to prevent in every possible way the young birds from catching colds—the common ailment when cold autumn snaps are experienced.

It should hardly require emphasizing that in handling artificially reared chickens, which have been brought up under practically hot-house conditions, special care must be taken with them throughout all stages of their development. It is safe to say that thousands of pullets every season are either lost or fail to lay when expected by reason of colds due to improper treatment on the part of their owners. The great weakness in this connection is that the average poultry-keeper gives too much consideration to the question of curing colds rather than to preventing them. As with other troubles affecting poultry, prevention is more satisfactory than treatment. If colds are to be avoided it is imperative that the pullets be protected from extremes of weather. A necessary factor is that the house be roomy, so that the birds can be fed inside in wet weather and fed early in the evening, so that they will not be moping about with wet plumage, waiting for their evening meal thrown down in a muddy yard.

Where colds have given trouble in the past the poultry-keeper must straightway take several measures if they are to be avoided in the future. He must first of all study his local conditions. Having proper housing designed on the deep open-fronted system, the next important point is to see that the houses are free from draughts and that the birds roost in comfort. This implies no cracks in the side or back walls allowing a draught of air between the opening in the front of the house

and the walls. Too often poultry-keepers take no notice of a few cracks in the partitions dividing the houses. This is a mistake, as colds can often be traced to neglect in this way. Unless the intersecting walls are draught-proof they should be made so with some airtight material, such as cheap roofing-material, &c.

The deep lean-to house with front partly open is now generally adopted, and rightly so, but the question of how much of the front of the house should be left open to provide ventilation is a matter that can be decided only according to the prevailing local conditions. Generally a space of 3 ft. is allowed, but experience goes to prove that where the plant is located on a bleak situation this amount of space must be reduced if colds are to be prevented. Especially does this apply where the perches are placed high above the floor. Some people go so far as to have an opening in both the front and back walls as a means of providing plenty of ventilation. Unless, however, the site is a well-sheltered one and mild climatic conditions prevail, colds are almost sure to appear where young stock are concerned. Good ventilation is an essential requirement for feathered stock of all ages, but it can be easily overdone with the artificially produced young pullet. It is a mistake to conclude that because adult birds keep free from colds in an overventilated or draughty house the growing pullet will do likewise. This does not mean that the pullets should be coddled, but rather that they should be intelligently handled. For instance, poorly ventilated quarters should be always guarded against, as in these the birds become overheated by night, making them susceptible to chill when they go out of doors in the morning. Then, again, in order to resist colds the pullets must not be overcrowded. Above all things, they must be kept in good condition by proper feeding and general common-sense management.

The first symptom of colds is sneezing, with a watery discharge from the nostrils and eyes. Colds are the forerunner of roup. If the breath becomes offensive, and a swelling or a cheese-like substance protrudes from the eye, it indicates that the cold has developed into roup. A cold may be treated successfully, but once the roup stage has been reached it will usually pay to destroy the bird at once rather than attempt to doctor it. With colds and roup the best advice is to prevent them, but if the birds become affected the cause should be sought and at once remedied. A simple method of treatment is to take a shallow dish, fill it with pure kerosene, and dip the bird's beak in this sufficiently deep to cover the nostrils. Hold the bird in this position until it breathes. This will have the effect of drawing the kerosene to the seat of the trouble. Repeat the treatment on alternate days until a cure is effected. In applying this treatment care must be taken to prevent the kerosene from getting on to the face of the bird, as it is apt to have an injurious effect. The nostrils should be covered and no more, while the dipped parts should be wiped with a dry cloth after each operation.

I would again emphasize that the aim of the poultry-keeper should be to prevent even a slight cold from making its appearance, by removing all sources favourable to its development. It should be remembered that the curing of colds involves considerable labour, and that even when a cure is effected the trouble is likely to recur at any time unless the cause is removed.

MARKING CHICKENS.

Poultry-keepers should on no account fail to mark the young stock as a future guide to age. A punch for the purpose, together with instructions as to its use, can be obtained at a moderate cost. Few people can accurately judge the age of fowls, and if there is no mark as an indication to age many of the current season's pullets are apt to be culled in the following year, while old and unprofitable ones may be retained on the plant. As the great majority of birds prove unprofitable to keep after their second laying season, the marking of young birds without delay is a matter that should appeal to the poultry-keeper who is really anxious to secure a maximum of profit from his flock. The best time of the year to cull is when the birds are taking a rest previous to moulting.

FORCING THE MOULT.

A correspondent asks if it would be a wise course to induce his birds to rest and moult now, with the hope of their laying better in the winter months. I cannot recommend this. For winter-egg production no doubt the pullet is the most desirable bird. The only safe course from the time when a pullet reaches maturity is to force every egg from her until her season is completed, irrespective of season and the price of eggs. Of course, an exception should be made with birds intended for future breeding purposes or those that are being bred from.

—F. C. Brown, Chief Poultry Instructor.

HORTICULTURE.

VEGETABLE-GROWING.

THE planting of the winter crops—savoy, cabbage, broccoli, celery, and leeks—should be completed as soon as possible. Where they are well established steady growth should be induced by regular hoeing and cultivation. Sometime during showery weather a dressing of nitrate of soda may be applied with benefit. If the weather is at all dry the celery trenches must not be allowed to suffer; similar treatment is required for the asparagus and rhubarb beds. All these crops should be induced to make strong steady growth during the autumn. Potato and onion crops should be harvested as soon as they ripen. Nothing is gained by allowing them to remain in the ground, as they sometimes do, and very great risks are run from second growth and disease. Spinach forms a popular and wholesome dish, and helps to provide that variety which is so desirable. A good sowing now will make rapid growth and afford early supplies. Towards the end of winter, vegetable-supplies begin to get short and the roots in store lose condition. It is then one looks forward to fresh spring cabbage and good salads. To secure these, lettuce and cabbage of an early variety should be sown towards the end of February, or rather earlier in southern districts. A piece of good land in a warm well-drained position on which to put out the plants can be prepared. The sowing of the early large white onion crop is best deferred for the present.

TOMATOES.

The tomato crop under glass should be freely ventilated. Remove the leaves below the ripening bunch and give liquid manure fortnightly. When the harvesting of this crop is completed, dig up the roots carefully and leave the plants hanging on the strings for a while till dry, when they should be removed and burnt. Clean up the house thoroughly by spraying or fumigating, and freely ventilate it. Broadcast a green crop—white mustard is popular at this season—and plough the seed in lightly with a small hand-plough.

The tomato crop outside will now be ripening, and packing and selling the fruit will be keeping growers busy. The public do not make the full use of tomatoes that they should. Many delicacies can be made from this fruit—sauces, purees, chutneys, and pastes—that are wholesome, tasty, and useful during winter. It is somebody's business to remind the busy public when tomatoes are in season, and educate them on their many and excellent uses. It is just as important to sell the fruit as to grow it.

THE BERRY CROPS.

Cultivation of the berry crops should be continued. Inspecting an area in gooseberries recently many that had been fine big plants were found to be dead. Lifting and examining two or three it was discovered that there were a number of severe horizontal cuts in the butts of the bushes, evidently made when hoeing. Cultivation among these crops requires to be done in a sympathetic as well as a thorough manner. The nicest consideration is necessary in order to obtain good results. All necessary spraying should be attended to. These crops need replanting from time to time, and such planting now requires careful consideration. The plants should be ordered early, and the ground carefully prepared, special care being taken to clean it of weeds—for strawberries more particularly. A dressing of superphosphate, and a green crop sown now to plough in later, would be an excellent preliminary preparation in many cases.

TOBACCO.

Tobacco-growers will now be busy harvesting and curing the crop. It must be remembered that this product is very responsive to treatment, and what are apparently details have very great results in the quality of the final product. For this reason the habit of close observation and attention to detail must be cultivated by those who wish to continue growing this plant successfully. The curing process must be regulated by the proper control of ventilators—opening them in damp weather and closing them when the weather conditions are dry, or reversely, just as it is desired to hasten or retard the curing process. This process should finally leave the plant-stalks and leaf-stems well dried out, a development usually taking six or eight weeks to accomplish under the air-curing system.

THE COUNTRY-HOME GARDEN.

The country home for its pleasure, convenience, and comfort depends very largely on the garden. If that is non-existent, or

practically so, a very important influence is lost. The furnishing of the interior of the home receives careful consideration, but our genial climate affords us every inducement and opportunity to enjoy the pleasures and conveniences of that outward adornment that can only be obtained at great expense in less favoured lands. The essential features of a satisfactory country garden need not occasion great expense or a large amount of work, although, of course, there are endless possibilities for those who take a special pleasure in it. Too often the ideals of many run in the direction of a flower-garden only, and one which contains a large collection of plants, and sometimes gives far more work than pleasure in its maintenance. An effective country-home garden should harmonize with the locality. It should surround the homestead, and include effective and ornamental shelter and shade, a reasonable amount of lawn of dwarf grasses, and paths well formed, graded, and metalled, but not in excess of those actually needed and used. The flower-garden feature is best kept to quite modest dimensions and variety, unless the household includes one or two enthusiasts in this direction. Shrubs, trees and palms, and bulbs growing in the grass supply in an easy way the main floral and decorative features for the majority.

The subject is referred to here as we are now approaching the season of the year for making or remodelling the garden—the autumn. To carry out the idea not so much money or work is required as consideration. The subject requires a great deal of careful thought, so that the best may be made of the circumstances, and that trees and shrubs naturally suited to the locality and purpose be selected and tastefully arranged. The short planting season commences towards the end of May, and by that time it is best to have any work of this kind completed and ready for the planting.

—W. C. Hyde, Horticulturist.

SOME C.O.R. JERSEYS IN TARANAKI.

EXPORT OF APPLES, 1925 SEASON.

1. CONDITIONS OF GOVERNMENT GUARANTEE.

CONDITIONS for the Government guarantee of 1d. per pound net return on shipments of apples made from New Zealand during the 1925 export season are as follows:—

1. The guarantee shall be limited to approved varieties and classes of fruit packed in compliance with the requirements of the "Extra Fancy" or "Fancy" grades, and shall be restricted to a maximum of 300,000 cases.

2. The Government's liability under the guarantee shall include all packing and marketing expenses which the Department of Agriculture may deem reasonable and necessary, plus 3s. 4d. per case. No allowance to be made for cool storage unless an approved system of precooling is adopted, in which event such allowance shall not exceed 5d. per case; and, further, the insurance allowance shall not exceed that required to provide an ordinary marine-risk cover. In case of shipments to the United Kingdom no charge for selling-commission exceeding 5 per cent. will be allowed, nor will a total exceeding 1s. per case be allowed for the following overseas charges—namely, supervision, port rates, dock charges, warehousing, cartage, tolls, porterage, forwarding, and surcharges.

3. The guarantee to be limited to fruit grown and shipped (otherwise than under a f.o.b. contract) by *bona fide* fruitgrowers or fruitgrowers' co-operative societies, through channels recommended to the Minister of Agriculture by the Fruit-export Control Board, and approved by him.

4. Any grower who exports any portion of his "Extra Fancy" or "Fancy" grade fruit crop outside the guarantee shall be deemed to have forfeited his right to participate in the guarantee with respect to all fruit exported during the season by him or on his behalf.

5. All fruit to qualify for the guarantee must be passed by an Inspector of the Department, and must be packed in accordance with the Export Regulations, subject to the modifications and directions set out in the appended statement entitled "Export Regulations."

6. Payment of claims under the guarantee shall be calculated on the basis of the average price received by the claimant for the whole of the "Extra Fancy" and "Fancy" grade fruit exported (otherwise than under a f.o.b. contract) on his account during the season, irrespective of markets.

7. Where, however, fruit of more than one variety and supplied by more than one grower is exported by a joint packing company or group in its own name the guarantee shall be calculated separately in respect of the whole of the fruit supplied for export by each grower, on the basis of the pool price received for each variety supplied by him with respect to each shipment; provided that the joint packing company or group shall have, not later than seven days after the fruit has been shipped from New Zealand, notified to the Director of the Horticulture Division full particulars of each grower's fruit included in each shipment.

8. The Government reserves to itself the right (*a*) to limit the quantity of fruit shipped to any particular port should freight rates or market conditions, &c., be deemed unsatisfactory; (*b*) to insist on all fruit being precooled prior to shipment, if deemed necessary; (*c*) to withhold the privileges of the guarantee from all fruit shipped in vessels the storage facilities of which are held by the Department to be unsatisfactory; (*d*) to withhold the privileges of the guarantee with respect to any market in connection with which the Fruit-export Control Board are of the opinion a satisfactory f.o.b. or c.i.f. trade is or can be established.

9. The Government reserves the right to re-examine and to withdraw any fruit from export in the event of such re-examination indicating that by reason of overmaturity or other cause inimical to the keeping-qualities of the fruit it would be inadvisable to allow such fruit to be exported. All fruit so withdrawn may be disposed of in New Zealand by the owner without reference to the guarantee, or by the Government on behalf of the owner. In the latter event the proceeds will be credited to the owner, and the transaction dealt with generally as though the fruit had been actually exported under the guarantee. But should such re-examination reveal the fact that any line of fruit, through careless or faulty packing, is decidedly below the standard required it will be deemed not to be covered by the guarantee, and the owner of such fruit may, at the option of the Minister, be held to have forfeited all right to participate in the guarantee for the remainder of the season.

2. EXPORT REGULATIONS.

The following regulations shall apply to all apples intended for export under the Government guarantee, 1925:—

GRADES AND VARIETIES.

"EXTRA FANCY" AND "FANCY" GRADES.

The standards shall be as set out in the Export Regulations of 1920, the principal requirements of which are as follows:—

Grade.	Colour.				Defects.
	Solid Red.	Partial Red.	Striped.	Yellow or Green.	
	Per Cent.	Per Cent.	Per Cent.		
Extra fancy	75	50	33⅓	Good characteristic colour	No more than 8 per cent. of apples in case affected with slight blemish.
Fancy ..	50	25	20	Good characteristic colour	Apples not to be affected with more than 5 per cent. blemish or 5 per cent. unnatural russet.

Ten per cent. and 5 per cent. reduction in the above-mentioned colour requirements with respect to "Extra Fancy" and "Fancy" grades will be allowed in connection with fruit packed for European markets.

VARIETIES.

The following varieties of apples (which were accepted for export in the 1923 season), owing to their unsatisfactory carriage and out-turn, and the low prices realized in consequence of this or other unsuitable marketing characteristics, have been omitted from the 1925 export list: Alfriston, Ballarat, Reinette du Canada, Washington.

The following have been omitted mainly on account of there being an insufficient quantity offering to warrant retention: Sharp's Late Red, Claygate Pearmain, Golden Russet, Scarlet Pearmain, Shepherd's Perfection.

The varieties marked with an asterisk in the following lists, although retained, are considered to be of little value for export purposes, and growers are advised to consider the reworking of these varieties, as well as those above mentioned, with a more suitable export variety, such as Delicious. In the case of London Pippin the fruit must be hand graded and sized, and specially good of the variety.

Approved for Export to Europe.

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
	Solid Red Varieties.				
96	Baldwin*	225	110	Rokewood	240
96	Hoover*	225	96	Tasma	225
	Partial Red Varieties.				
110	Crofton	225	110	Scarlet Nonpareil ..	240
96	Delicious	225	110	Shorland Queen ..	225
110	Dougherty	255	96	Spitzenberg	225
110	John Sharp ..	225	110	Stark	225
110	Jonathan	240	110	Wagner	225
110	King David ..	240	110	Worcester Pearmain ..	225
96	Rome Beauty ..	225	110	Yates	255

Approved for Export to Europe—continued.

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
	Striped Varieties.				
110	Adams Pearmain ..	225	120	Ribston Pippin ..	225
110	Allington Pippin* ..	225	110	Senator	225
120	Cox's Orange ..	255	110	Statesman	240
96	Premier	210	110	Stayman Winesap ..	210
	Yellow or Green Varieties.				
96	Boston Russet ..	225	96	London Pippin* ..	200
110	Brownlee's Russet ..	225	96	McMahon's White ..	225
110	Cleopatra	240	110	Newtown Pippin ..	240
96	Dunn's	210	96	Parlin's Beauty* ..	225
110	Golden Pippin ..	225	110	Sturmer	240
110	Grannie Smith ..	225	110	Willie Sharp ..	225
110	Gravenstein ..	225			

Approved for Export to South America.

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
	Solid Red Varieties.				
80	Baldwin	140	96	Rokewood	140
80	Hoover	140	64	Tasma	140
	Partial Red Varieties.				
96	Crofton	140	80	Scarlet Nonpareil ..	140
80	Delicious	140	80	Shepherd's Perfection	140
80	Dougherty	140	96	Shorland Queen ..	140
96	Jonathan	140	80	Spitzenberg	140
96	John Sharp ..	140	96	Stark	140
96	King David ..	140	96	Wagner	140
80	Rome Beauty ..	140	110	Yates	140
80	Salome	140			
	Striped Varieties.				
96	Adams Pearmain ..	140	80	Senator	140
80	Australian Dougherty	140	96	Statesman	140
80	Premier	140	80	Stayman Winesap ..	140
	Yellow or Green Varieties.				
96	Cleopatra	140	96	Sturmer	140
80	Dunn's	140			

SPECIAL CONDITIONS APPLYING TO EXPORT TO SOUTH AMERICA.

The modifications regarding colour standards allowed for European markets will not apply to apples for the South American market.

Grades: No fruit below the standard of "Fancy" grade as defined in the Export Regulations to be exported to South America.

"GOOD" GRADE.

Fruit packed in accordance with the requirements of "Good" grade may be exported to European markets only. The standard of the grade shall be as provided by the 1924 export conditions, the principal of which are:—

Grade.	Colour.				Defects.
	Solid Red.	Partial Red.	Striped.	Yellow or Green.	
	Per Cent.	Per Cent.	Per Cent.		
Good ..	30	15	10	Good characteristic colour	5 per cent. blemish or 15 per cent. unnatural russet.

The varieties for export under this grade shall be as set out in the European export list, excepting that the minimum size of any variety shall be not less than 210 apples per case, other than Cleopatra, Dougherty, Jonathan, King David, Sturmer, and Yates, the minimum size of which shall not be less than 225, and Cox's Orange 240 per case.

REGISTERED EXPORT NUMBER.

The registered number issued to all growers under the Local Market Regulations will be declared to be the grower's registered export number also. The registered number of each grower must be branded on each case of fruit exported by him.

In respect to fruit packed by a packing organization to which a registered number has been allotted, such consignments may be marked with the registered number of the packing association only, provided that each grower's fruit is shown separately on the advice-note for examination, and stacked in separate lots, so that the Inspector may have no difficulty in determining which is the particular lot under examination. For example, a line of 100 cases of Cox's Orange coming from two different growers would be submitted as follows:—

Shipping-mark.	Registered Export Brand.	Total Number of Cases.	Variety.	Grade.	Number of Cases.	Pack.
345	P607	60	Cox's Orange ..	Fancy ..	14	163
			,, ..	,, ..	14	175
			,, ..	,, ..	8	188
			.. ..	,, ..	12	210
			,, ..	,, ..	12	225
345	P607	40	Cox's Orange ..	Fancy ..	8	163
			,, ..	,, ..	5	175
			,, ..	,, ..	7	188
			,, ..	,, ..	9	210
			,, ..	,, ..	11	225

These would be stacked separately in two lots, and examined as different lines.

Should unavoidable circumstances prevent the adoption of this procedure, resulting in a line comprising a larger number of cases being submitted as one line, it must be definitely understood that the examination of same will be solely at the grower's risk, and in the event of any fruit forming a portion of the line being found to be unsatisfactory the whole line will be liable to rejection.

LABELLING AND MARKING.

A coloured label corresponding with that used in the 1924 season has been approved for use in connection with "Extra Fancy" and "Fancy" grade fruit. A non-coloured label of similar design has been approved in connection with "Good" grade fruit. All cases of fruit intended for export must bear a label on each end according to grade, as above indicated.

The marking of cases shall be in accordance with the 1924 season's requirements.

LABELS FOR TRAYS.

Special labels for use on apple and pear trays have been prepared, and will be procurable from the New Zealand Fruitgrowers' Federation.

WRAPPING-PAPER.

Apples of the various sizes as set out below shall be wrapped in paper of the size indicated opposite each respectively :—

Sizes 64's to 80's (both inclusive), paper 11 in. by 11 in.
Sizes 88's to 110's (both inclusive), paper 10 in. by 10 in.
Sizes 120's to 200's (both inclusive), paper 9 in. by 9 in.
Sizes 210's to 240's (both inclusive), paper 8 in. by 8 in.

In the event of the size of the paper used being smaller than that specified above for any respective size of apples, such apples shall be double-wrapped by overlapping two papers.

SPECIFICATIONS OF EXPORT CASE.

The timber recommended for the construction of an export fruit-case is white-pine of good quality, but *Pinus insignis*, rimu, and beech timber, if well and evenly cut, will be accepted. Owing to the unsatisfactory nature of cases constructed of poplar timber, cases of this class will not be approved for export.

The inside measurements of the export bushel case shall be 10 in. by 11¼ in. by 19¾ in.

Sizes of timber : The ends shall be made of boards of the following size—10 in. by 11¼ in. by ¾ in. ; one-piece board at each end ; both end boards to be planed on the outer side. The sides shall be made of boards of the following size—10 in. by 21¼ in. by $\frac{5}{16}$ in. ; one or two boards optional for each side, provided that no side board shall be less than 4¼ in. in width. The tops and bottoms shall be made of boards of the following size—11 in. by 21¼ in. by $\frac{5}{16}$ in. ; one or two boards optional, provided that no board used for the purpose is less than 5 in. in width. Provided that tops and bottoms may be made of boards of the following size—11 in. by 21¼ in. by $\frac{3}{16}$ in., to be used with the addition of four cleats per case, measuring 11 in. by 1 in. by $\frac{5}{16}$ in.

In the event of two-piece sides being used in the construction of the case above referred to, the space between the boards shall not exceed ¼ in. In the event of two-piece tops and bottoms being used the space between such boards shall not exceed ½ in.

Nailing : Nails used to be not less than 1½ in. long, 14 gauge. Nails to be spaced not more than 3 in. apart, and the outer nails of each board to be not more than 1 in. from the edge of board.

Strapping : All cases to be strapped with a wire or steel band, such strapping to be tightly applied and to be not more than 1 in. from end of case.

CONSTRUCTION OF TRAYS.

Selected apples and pears may be exported—the former under the guarantee—in wooden trays having an inside measurement of 11¼ in. by 19¾ in., with depth from 2½ in. to 3 in. Each tray to be complete with lid and label. Three trays to be securely wired together, forming one package. Binding-wires to be placed within 1 in. of each end of the package. Timber for the construction of trays to conform in thickness to that prescribed for the standard apple-case.

CASES AND PACKING.

Specifications of the standard export case shall be strictly observed.

Corrugated strawboard or wood-wool shall be used on top and bottom of cases. All large fruit to be double-wrapped unless paper of sufficient size is used.

MINIMUM CONSIGNMENT.

Twenty cases of any one variety shall be the minimum consignment accepted for export.

WEATHER RECORDS: DECEMBER AND CALENDAR YEAR 1924.

Dominion Meteorological Office.

GENERAL SUMMARY FOR DECEMBER.

Dull, mild, and humid conditions were features of December weather, and were associated with some heavy rainfalls, especially in the North Island and north-eastern parts of the South Island, owing to a succession of ex-tropical disturbances passing in and northward of Cook Strait.

Returns to hand show heaviest rainfalls in the Wairarapa: Masterton had a total of 13·28 in., which is 417 per cent. of the average; and Greytown recorded 12·54 in. Mangahao, the water-power centre for Wellington District, had 14·36 in.; Wellington 11·39 in., which is 256 per cent. of the average; and Wainuiomata, the main water-supply for the city, recorded 23·12 in. The only parts of the country so far showing they had less than the average December falls are around Hokitika, Greymouth, Queenstown, and Clyde. Parts of Central Otago and South Canterbury report more wet weather than usual. Pleasant Point, twelve miles inland from Timaru, recorded 8·33 in.—the heaviest monthly fall at that station in twenty-one years. Otautau (Southland), however, reports a fine, dry month, with a total of 3·73 in.

Summer electrical conditions were prevalent, and thunderstorms were reported, chiefly about the 5th, 7th, and 22nd.

Barometric changes were common, but the fluctuations of pressure were more frequent than phenomenal, though the means for the month were everywhere considerably below the average.

—*D. C. Bates, Director.*

RAINFALL FOR DECEMBER AND CALENDAR YEAR 1924 AT REPRESENTATIVE STATIONS.

Station.	December.				Calendar Year.	
	Total Fall.	Number of Wet Days.	Maximum Fall.	Average December Rainfall.	Total Rainfall, 1924.	Average Rainfall.
North Island.						
	Inches.		Inches.	Inches.	Inches.	Inches
Kaitaia	5·56	14	1·82	3·28	76·72	50·87
Russell	4·94	10	2·28	2·05	57·01	48·85
Whangarei	6·12	11	2·00	2·49	73·76	60·24
Auckland	4·41	18	1·25	2·86	66·66	44·20
Hamilton	8·06	24	2·17	3·68	65·53	49·72
Kawhia	6·56	18	1·48	3·21	62·96	52·70
New Plymouth ..	9·60	21	1·94	4·28	72·22	59·95
Inglewood	11·58	21	2·34	7·43	117·23	104·45
Whangamomona ..	8·56	18	2·25	5·98	90·18	80·15
Tairua, Thames ..	7·98	14	3·20	4·30	95·88	65·82
Tauranga	8·87	18	3·56	3·35	62·58	51·95
Maraehako, Opotiki ..	4·00	7	1·08	2·82	71·23	50·77
Gisborne	2·28	11	0·52	2·13	53·42	46·96
Taupo	5·70	13	1·60	3·66	55·59	45·20
Napier	2·30	12	0·49	2·04	36·72	36·56
Maraekakaho, Hastings	4·75	19	0·96	2·21	36·85	34·77
Taihape	5·37	17	1·16	3·43	45·90	40·18
Masterton	13·28	15	7·06	2·57	48·89	38·71
Patea	9·40	20	2·54	3·35	60·37	44·05
Wanganui	5·18	11	0·93	2·63	38·81	36·86
Foxton	7·61	..	1·83	2·15	38·76	31·43
Wellington	11·39	16	2·74	3·20	49·21	48·09

RAINFALL FOR DECEMBER AND CALENDAR YEAR 1924—*continued.*

Station.	December.				Calendar Year.	
	Total Fall.	Number of Wet Days.	Maximum Fall.	Average December Rainfall.	Total Rainfall, 1924.	Average Rainfall.
South Island.						
Westport	6·73	23	1·83	6·60	82·24	78·31
Greymouth	7·31	17	0·96	8·95	96·50	104·13
Hokitika	9·49	20	1·75	10·60	133·78	116·53
Arthur's Pass	8·92	18	1·14	12·02	162·81	147·11
Okuru, Westland ..	8·62	12	1·68	11·73	171·37	148·32
Collingwood	8·15	14	2·10	8·01	101·64	99·81
Nelson	6·83	16	1·38	2·67	53·94	37·60
Spring Creek, Blenheim	4·19	14	1·12	1·93	33·81	30·12
Tophouse	7·99	18	2·14	5·00	69·22	60·78
Hanmer Springs ..	11·00	19	1·70	2·89	50·31	39·11
Highfield, Waiau ..	6·60	17	1·28	2·51	34·13	33·38
Gore Bay	5·55	17	0·96	2·12	31·87	31·63
Christchurch	3·94	18	0·91	2·03	25·33	25·00
Timaru	4·72	16	0·98	2·38	19·54	23·15
Lambrook, Fairlie ..	7·28	12	2·16	2·33	26·51	25·09
Benmore, Omarama ..	3·74	20	1·08	1·77	29·74	24·15
Oamaru	..	..	..	2·06	..	22·03
Queenstown	1·98	13	0·51	2·55	35·65	30·39
Clyde	1·54	8	0·74	1·79	17·79	15·03
Dunedin	..	..	..	3·50	..	36·85
Gore	..	..	..	3·36	..	35·17
Invercargill	4·66	19	0·86	4·34	36·73	46·48

FORTHCOMING AGRICULTURAL SHOWS.

Tapanui Farmers' Club: Jubilee Show, Tapanui, 28th January.
Pahiatua A. and P. Association: Pahiatua, 30th January.
Maniototo A. and P. Association: Ranfurly, 6th February.
Clevedon A. and P. Association: Clevedon, 7th February.
Dannevirke A. and P. Association: Dannevirke, 11th and 12th February.
Te Puke A. and P. Association: Te Puke, 12th February.
Rodney Agricultural Society: Warkworth, 14th February.
Northern Wairoa A. and P. Association: Mititai, 17th and 18th February.
Masterton A. and P. Association: Solway, 17th and 18th February.
Te Awamutu A., P., and H. Association: Te Awamutu, 18th February.
Whakatane A. and P. Association: Taneatua, 18th February.
West Coast A. and P. Association: Greymouth, 18th and 19th February.
Rotorua A. and P. Association: Rotorua, 20th February.
Buller A. and P. Association: Westport, 20th and 21st February.
Waiapu P. and I. Association: Ruatorea, 25th and 26th February.
North Kaipara Agricultural Association: Paparoa, 26th February.
Tauranga A. and P. Association: Tauranga, 26th February.
Opotiki A. and P. Association: Opotiki, 26th February.
Franklin A. and P. Association: Pukekohe, 27th and 28th February.
Omaha and Pakiri A. and H. Association: Leigh, 28th February.
Taumarunui A. and P. Association: Taumarunui, 4th March.
Waikato Central A. Association: Cambridge, 4th and 5th March.
Mangonui A. and P. Association: Mangonui, 6th and 7th March.
Morrinsville A., P., and H. Society: Morrinsville, 11th March.
King-country Central A. and P. Association: Te Kuiti, 12th March.
Matamata A. and P. Association: Matamata, 19th March.
Mayfield A. and P. Association: Mayfield, 21st March.
Methven A. and P. Association: Methven, 26th March
Temuka and Geraldine A. and P. Association: Winchester, 2nd April

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

CHICKWEED AND SHEEP.

N. TILLEY, Takapau :—

I lost three ewes recently, and am somewhat puzzled as to the cause of death. In each case the ewe was in good condition and the mother of a thriving well-grown lamb. They were running on good pasture, mostly cocksfoot and dogstail. My theory is that the favourable growing-weather during the spring encouraged some weed to grow that is fatal to sheep if eaten. The enclosed weed is very prevalent this season : is it harmful ?

The Live-stock Division :—

The weed specimen you forwarded has been identified as mouse-eared chickweed (*Cerastium vulgatum*), a close ally of the common chickweed. According to certain authorities the chickweeds cause disorder to the digestive system when eaten in large quantities, but a definite opinion could not be given in your case without further investigation.

CONTROL OF VARIEGATED AND WING THISTLES.

G. F. BAYLY, Turakina :—

On my property in the Turakina Valley a quantity of variegated and wing thistles have yearly made their appearance on the tops of ridges and in sheep-camps. This year they are exceptionally bad. It has been the practice of farmers generally to cut the variegated thistle and leave the wing thistle untouched, but I find that where the variegated thistles have been cut earlier in the spring the wing thistles have come considerably thicker. Is the only method of eradicating this pest to cut them ? As mentioned, the thistles practically appear only on the very tops of the ridges, suggesting that the ground may be deficient in some plant-food, yet not sufficiently deficient to prevent the thistles appearing. Is there any manure that would help bring back the grass, and thus perhaps smother out the weeds ?

The Fields Division :—

Both variegated and wing thistles are found chiefly on country that is broken by the tramping of stock or similar means, this providing a good seed-bed. Sheep-camps and gateways are particularly bad. The past season in your district being wetter than usual, the land was considerably poached ; consequently thistles are very bad this year. Variegated thistles cover a considerable area of ground, and for the time being control the growth of grass ; then, the cutting disturbs the soil to some extent, and this further increases the area that is suitable as a seed-bed for the wing thistle, and the latter gets away before grass is re-established. Both these thistles may be controlled by spraying with a good weed-destroyer or an arsenical preparation, but this is expensive, and generally cutting is considered the cheapest and most effective method. The fact that thistles grow well on certain parts indicates that the land is well provided with plant-food, and most crops should do well after them. Top-dressing with a good phosphatic manure like basic super or super and lime would greatly strengthen the pasture and help to crowd out the thistles.

REMOVING BEES FROM WALL OF HOUSE.

M. C., Dannevirke :—

Bees have taken possession of the inner wall of a bedroom, much to the annoyance of the occupant. Will you kindly inform me how to dislodge them with safety to an operator who is totally ignorant of their habits ?

The Horticulture Division :—

The quickest plan to adopt is to strip the boards on the inner wall of the building so as to expose the combs. If the services of a beekeeper are not available bees can be successfully removed by proceeding as follows: Take a bee-smoker and charge it with dry sacking, so that when lighted the smoke can be forced in at the entrances which the bees are using. Usually a few puffs of dense smoke will drive the bees to the honey, and they can then be handled without much risk of the operator getting stung. The weatherboards or other material can then be removed, the bees brushed into a box, and the combs removed. After the operation is complete block up all entrances, so as to prevent further swarms from taking possession; and if the inside woodwork is smeared with carbolic acid or a pungent chemical this will act as a deterrent to bees again entering the building. If the operator is nervous a veil should be worn.

RABBIT-POISON AND ROAD-LINES.

"Cocky," Feilding :—

Please let me know whether poison can be laid for rabbits closer to a public road than 2 chains.

The Live-stock Division :—

Rabbit-poison may be laid right up to the road-line. Every precaution should, of course, be taken to prevent the possibility of accident (especially when strychnine is used) by giving or posting of notices. Section 15 of the Police Offences Act provides that poison shall not be laid on or within 3 chains of any highway outside of any borough or town district. This provision, however, does not apply in the case of poison laid for the destruction of rabbits. If you desire a ruling on a definite case it is recommended that you consult a solicitor, as the matter may be governed by special circumstances.

PRE-MIXING OF FERTILIZERS.

Palmer Bros., Whangamata :—

We expect to be top-dressing about 350 acres of hill country this coming autumn with a 50-50 mixture of super and Nauru, plus 1 cwt. or so of sulphate of potash per ton. Would you kindly inform us whether there would be any disadvantage in having the manure mixed at the works, assuming that some of it may not be spread for four or five weeks?

The Fields Division :—

There would be no disadvantage whatever in having the mixture made up at the works, as the constituents mentioned can be safely mixed, and if the material is kept dry no deterioration will take place over a period of four or five weeks.

EARLY-CALVING HEIFER.

"New Chum," Waipukurau :—

A grade Jersey heifer six months old got to a Jersey bull, with the result that she is due to calve when only about fifteen months. I would be glad of advice as to when she should be sent to the bull again, how long should she be milked before drying off, and whether any special feeding, other than good pasture, would be beneficial to help build her up. Would her calf, if a heifer, be worth saving?

The Live-stock Division :—

It would be as well not to mate the heifer again for at least six months or longer if she is not well grown. The period of milking would depend on the extent of the flow of milk when she calves. She should not be dried off too quickly, in case permanent injury is done to the udder. If the pasture is good and continues plentiful no other feed should be necessary, but a small feed of crushed oats and bran once daily would assist in building up her constitution. The calf should be worth saving.

SIZES OF FARMS IN NEW ZEALAND.

THE average area of occupied holdings of over one acre in 1924 was 505·84 acres, the average for the North Island being considerably smaller than that for the South. The following table gives particulars by land districts:—

Land District.	Number of Holdings occupied.	Aggregate Area.	Average Area per Holding.	
			1924.	1923.
North Island—		Acres.	Acres.	Acres.
North Auckland ..	13,898	3,022,819	217·50	220·85
Auckland	12,287	4,126,880	335·87	339·35
Gisborne	2,859	2,755,115	963·66	966·91
Hawke's Bay	4,396	2,034,663	462·84	493·32
Taranaki	6,661	1,724,336	258·87	261·29
Wellington	11,271	4,964,444	440·46	441·86
South Island—				
Nelson	3,870	1,301,687	336·35	338·94
Marlborough	2,010	2,484,876	1,236·26	1,234·34
Westland	1,497	1,780,719	1,189·53	1,200·15
Canterbury	13,516	8,150,113	603·00	605·41
Otago	8,006	7,994,927	998·62	997·54
Southland	5,868	3,231,985	550·78	550·72
Totals for Dominion	86,139	43,572,564	505·84	510·45

Since 1918 there has been a steady decrease in the average area occupied in holdings of one acre or more. This decrease was not stayed in 1924, the average for which is 4·61 acres less than for 1923. This decrease continues in spite of the fact that from time to time small holdings contained within boroughs (the boundaries of which are altered) are withdrawn from the scope of this inquiry.

—*Census and Statistics Office Report.*

PUBLICATIONS RECEIVED.

"NEW ZEALAND FLOCK-BOOK (SOUTH ISLAND)," vol. XX, 1924. Published by the Council of the New Zealand Sheep-breeders' Association (South Island), Christchurch. Comprises the following breeds: Lincoln, English Leicester, Border Leicester, Romney, Southdown, Shropshire, Merino, Corriedale, Ryeland, Suffolk, Dorset Horn, and Halfbred.

"FORDSON FARMING IN NEW ZEALAND." Compiled by the Charles Haines Agency, Wellington. Gives the experience of many New Zealand farmers with this machine and tractor-power generally.

Grading of Dairy-produce at Napier.—Napier has been appointed a grading-port under the Dairy Industry Act, with the buildings in the occupation of Messrs. Niven and Co., at Port Ahuriri, as a store for the storage, cooling, or freezing of dairy-produce prior to export. This came into force on 11th December.

Precautions against Foot-and-mouth Disease.—The State of Texas has been added to those States of the American Union from which the importation of certain goods into New Zealand is prohibited. The full order concerning this matter was published in the *Journal* for August last (page 140).